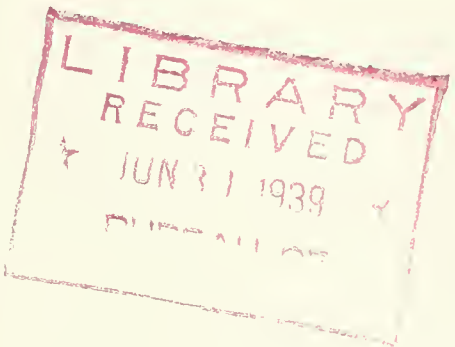
THE INSECT PEST SURVEY BULLETIN



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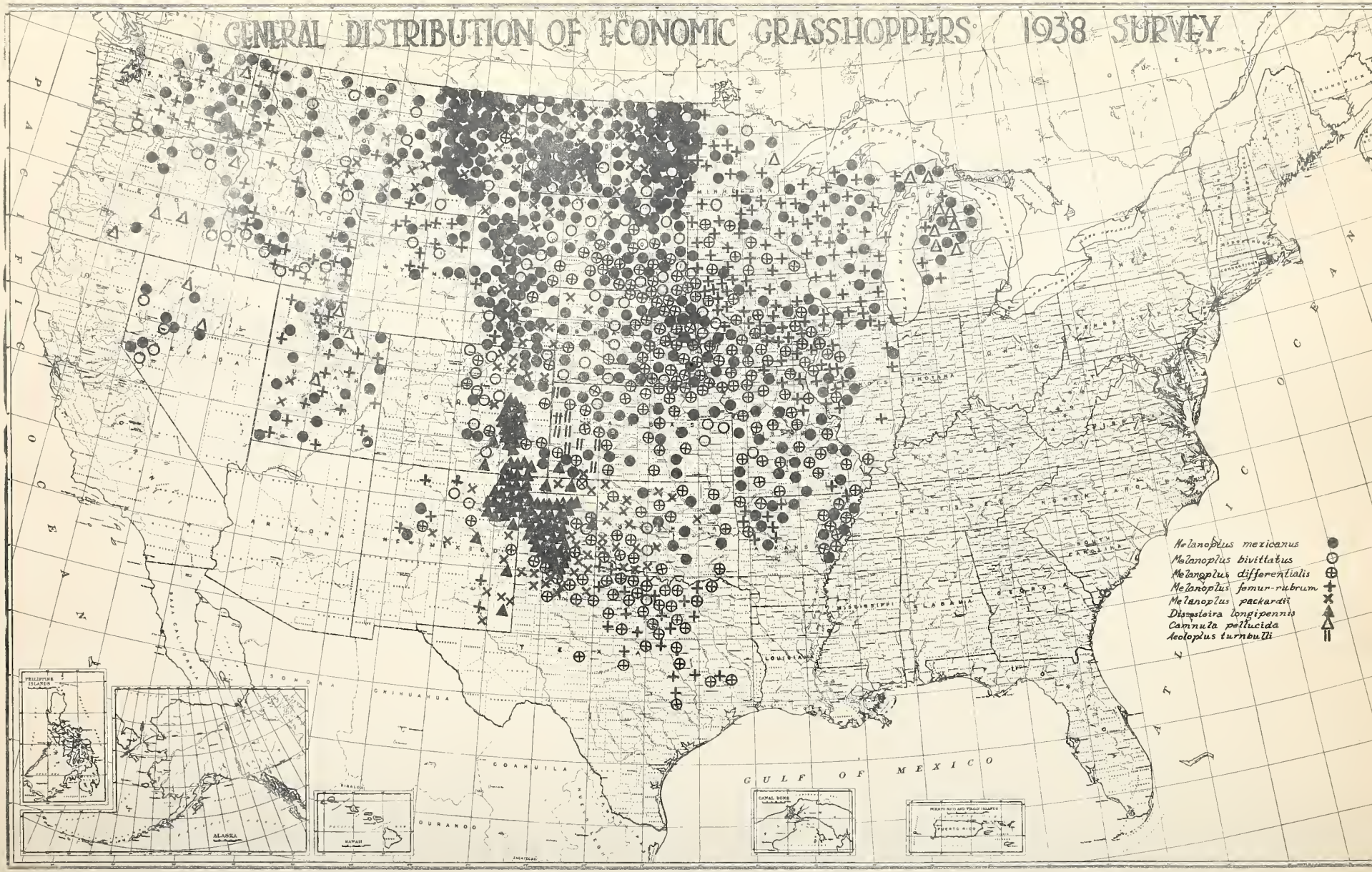
UNITED STATES
DEPARTMENT OF AGRICULTURE
AND
THE STATE ENTOMOLOGICAL
AGENCIES COOPERATING

DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Preliminary Edition
Subject to corrections

UNITED STA
BASE MAP

GENERAL DISTRIBUTION OF ECONOMIC GRASSHOPPERS 1938 SURVEY



Base compiled by U. S. Geological Survey
Projection and ruling by the U. S. Coast and Geodetic Survey
Albers equal-area projection
North American datum

Scale 1:10,000,000
Approximately 80 miles to 1 inch
0 80 160 320 Miles

1938

I N S E C T P E S T S U R V E Y B U L L E T I N

Vol. 19 Supplement to Number 4 June 15, 1939

THE SPECIES AND DISTRIBUTION OF GRASSHOPPERS IN THE 1938 OUTBREAK

Robert L. Shotwell, Entomologist
Bureau of Entomology and Plant Quarantine
United States Department of Agriculture

The year 1938 was the fifth year in which grasshoppers were collected in typical environments in the several States included in the annual grasshopper survey. Data from the 1934, 1935, 1936, and 1937 collections were published as supplements to the Insect Pest Survey Bulletin as follows: Volume 14, number 9; Volume 16, number 5; Volume 17, number 3; and Volume 18, number 6.

The present paper is based on tabulated data from collections made in 21 States, as follows: Arkansas, Colorado, Idaho, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Wisconsin, and Wyoming. Small collections were made in the State of Washington but not of sufficient size to be included in this report. Over 196,000 specimens were taken in the common crops and native habitats of the different States. These specimens have all been identified and recorded as to the numbers of each species in each environment and these data have been recorded for each State as percentages of the total number collected in a single habitat. The identification of these specimens represents an immense amount of work and the credit for this goes to F. E. Skoog, field assistant, who has had charge of this work for the last 2 years.

It has been explained in other reports that there are imperfections in the survey and the results are to be considered only in a general way. After 5 years, a study of the results indicates definitely certain trends and changes in the relative abundance of the different species which have been borne out by field observations.

In 1937 Dissosteira longipennis in the Colorado-New Mexico area held the spotlight of interest in grasshopper activities. Again in 1938 this species aroused a greater interest in the States infested including larger areas in the Panhandle of Texas. Of greater import for the entire grasshopper area, however, were the major flights of Melanoplus mexicanus, the

greatest in recent history, which occurred in July 1938 in the Northern Great Plains area. These developed from large reservoirs of this species which hatched out in numbers ranging from 1,000 to 10,000 per square yard in idle and weedy range lands adjacent to cropped fields. These reservoirs were located in large areas of north-central South Dakota, east of the Missouri River, such areas continuing northward into North Dakota and thence diagonally northwestward across that State and in other areas in the southwestern part of North Dakota. The flights were to the northeast, north, northwest, and some southwest, infesting new territory in the Red River Valley of Minnesota and North Dakota, parts of northern North Dakota, a reinfestation in the Mandan to Dickinson areas, including the Bad Lands, the eastern half of Montana, which had no serious infestation to begin with; a large part of extreme eastern Wyoming; and the Black Hills area of western South Dakota.

Nymphal surveys were conducted in the northeastern quarter of South Dakota from May 7 to July 2, inclusive. The high spots of the trend of the grasshopper populations for fields and field margins were as follows:

Date	Population found in--	
	Field	Field margin
	Number	Number
May 7	5	35
June 4	192	260
June 18	190	245
July 2	73	119

These are averages of all the observations made in the northeastern quarter in which populations as high as 1,500 per square yard in the field were recorded in some places between June 4 and June 18. There was a general exodus of M. mexicanus from this area the last week of June and the first week of July. This is evidenced in the figures from the nymphal survey which show a sharp decrease of population between June 18 and July 2. This would have been more marked if it had not been for Melanoplus differentialis coming in about this time and holding up the populations to a certain extent.

A similar population trend in eastern Montana was as follows:

Date	Population found in--	
	Field	Field margin
	Number	Number
May 28	10	83
June 4	18	44
June 18	22	80
July 9	60	76

There was an increase in average populations which was more marked in a study of the individual observations where counts of 200 and 300 per square yard were common in fields having only 5 per square yard before the grasshoppers flew in. H. B. Mills, State entomologist of Montana, has described the migrations of M. mexicanus into Montana in his report, "Montana Insect Pests for 1937 and 1938" (Rpt. 27, State Ent. Bull. No. 368, pp. 12-16, Jan. 1939). This description is based on observations made by Federal and State men connected with the grasshopper-control program who were checking on the flights. In this article Mills has mapped the spread of M. mexicanus into eastern Montana. Beginning with July 1 in Wibaux, Fallon, and Carter Counties, the crest of the migration moved progressively westward and northwestward until by July 17 it reached into Blaine, Petroleum, and Treasure Counties, or a line north and south 200 miles west of the eastern State boundary. Here the flights terminated and it is in this area that egg deposition was the heaviest. These migrations also extended north into Saskatchewan.

The small farms in the Black Hills of South Dakota also received their share of these migrants. This was evidenced by the high egg counts in this area. All of the eastern counties in Wyoming were also on the receiving end of these migrations. In Goshen County north of Torrington the area invaded by the migration of M. mexicanus shows egg counts of 4 to 16 pods per square foot in the field and 1 field of 29 pods per square foot. Unless conditions unfavorable to grasshopper development occur, this area in 1939 will probably produce as heavy populations as those which developed in north-central and eastern South Dakota in 1938. If this happens then large flights of M. mexicanus can be expected to develop in this area.

The other area where heavy egg deposition occurred from these flights was the reinfested section in the region north and south of a line from Mandan to Medora, N. Dak. Egg predators reduced the number of good eggs 25 to 75 percent, otherwise this would have been the most heavily infested of all the areas. Viable egg pod counts here still run 4 to 16 per square foot.

Egg Survey of Range and Idle Land in the Melanoplus mexicanus Area Proper

As a part of the fall grasshopper-egg survey in the Northern Great Plains area infested by M. mexicanus, a separate survey was made of the range and idle land. In this survey only egg pods of this species were considered insofar as it was possible to determine their identity by superficial inspection. The States in which surveys were made were Montana, North Dakota, South Dakota, Wyoming, and the western part of Nebraska. Only a few examinations were made in Nebraska. The survey was divided into two parts, one being done as a special survey made by R. A. Roberts and the other as a part of the regular crop survey made by the district surveyors. Mr. Roberts has written up his report as a separate project for comparison with the reports of the district surveyors.

The method was to examine at least 10 1-square-foot samples of surface soil or sod and record the number of M. mexicanus pods found therein. At each place of examination an average number of pods per square foot was determined and recorded. The range land was arbitrarily divided into two parts. The one part was called adjacent to crop and included all range land within 1 mile of crop land. The other was designated as open range and included all that which was recorded as beyond the 1-mile limit. There were 1,558 fields and range areas examined in both surveys. The results are compiled in tables, which are self-explanatory. So far as possible the number of pods per square foot were recorded for the cropped fields in the vicinity of the range and idle lands observed. The following is an excerpt from the report made by R. A. Roberts summarizing the results of his "Survey of the Range and Idle Lands of the Northern Great Plains Area in Relation to Infestations of Melanoplus mexicanus:"

"The writer made a survey of this territory beginning September 11, 1938, and concluded October 23. Briefly, the survey began at Glendive, Mont., extended southeast to Sully County, S. Dak.; north to Bismarck, N. Dak.; northwest to Plentywood, Mont.; west along the Canadian border to Opheim, Mont.; south to Torrington, Wyo.; east to Alliance, Nebr.; and north to Bowman, N.Dak. Generally speaking the infestation, as indicated by egg deposition, was lightest in the eastern part of the Dakotas, increasing to heavy in central North Dakota and being very heavy along the Canadian line and in eastern Montana. Two heavy areas were found in Wyoming--the Crook-Weston Counties area and the Niobrara area. Idle land appeared to be infested to about the same extent as crop land, although the figures are not so conclusive as those obtained in the general survey. Favored places in idle land consist of land idle about 2 years where black prairie soil has settled firmly. Sandy loam is also favorable. Eggs are frequently deposited under last season's Russian-thistle, this year's Russian-thistle, and Amaranthus (recumbent form). The longer the land lies idle the more nearly it resembles pasture land, being marked by increase in grasses and decrease in weeds. This should lead to a corresponding decrease in the number of M. mexicanus eggs found. The decrease could not be expected until the change in flora has occurred. Range land adjacent to crop land is nearly always overrun by Russian-thistles and it is fairly easy to find egg pods under these weeds. Low-growing, bushy sage clumps were found to be favored locations and many egg pods were found under sage plants. Search in dense sod was very disappointing, more pods being found in light areas of bunchgrass and other western grasses. On open range clumps of sage and occasional weeds appeared to be the best places to search for eggs. An open range area of unusual significance was found in the piney-butte area in Garfield County, Mont., between Fort Peck and Jordan. In this area where no crops were present, stops were made every 5 miles with average egg pods as follows: 0.4, 0.2, 0.8, 1.2, and 0.2. At one of these stops 31 egg pods were found in a single 1-foot-square sample taken under a Russian-thistle by the roadside, but this sample was not counted. Although in general, egg deposition was light on open range, it is obvious that in areas of heavy adult population where no crops are present oviposition will necessarily take place. It is suggested that in the future examinations in these areas be made in sage clumps and other favorable locations."

Table 1.--Summary of 1,394 1-foot-square soil samples showing data pertaining to infestation of Melanoplus mexicanus. Samples collected by R. A. Roberts in North Dakota, South Dakota, Montana, Wyoming, and Nebraska, September 11, to October 21, 1938

Kinds of land sampled	Fields sampled	Samples	Viable Pods	Average viable pods per square foot	Fields in which no eggs were found	Fields in which some eggs were found	Average good pods per square foot where some eggs were found	Beefly larvae found	Beefly destroyed on pods reported	Blister beetles found
	Number	Number	Number	Number	Percent	Percent	Number	Number	Percent	Number
Cropped---------	58	520	520	1.00	16	84	1.12	232	31	49
Idle------------	39	378	270	.71	10	90	.78	79	23	15
Open range------	16	152	70	.46	31	69	.57	9	11	1
Adjacent range 1/	31	344	146	.42	23	77	.52	70	32	10
Total---------	144	1,394	1,006	0.72	17	83	0.83	390	28	75

1/ Range within 1 mile of crop land.

Table 2.--Summary of 1,558 cropped fields, idle fields, and range areas sampled for grasshopper eggs 1938

Kinds of land sampled	Fields and range areas sampled in--						Mean average pods per sq. ft. sample in						Stops with av. below 0.2 pods per sq. ft.	Stops with av. above 0.2 pods per sq. ft
	Montana	Nebraska	N. Dakota	S. Dakota	Wyoming	Total	Montana	Nebraska	N. Dakota	S. Dakota	Wyoming	Total		
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	Percent	Percent
Idle	200	45	158	118	20	541	1.03	1.65	1.24	0.74	0.90	1.08	--	--
Adjacent range 1/	200	7	88	75	44	414	.54	.77	.49	.29	.26	.45	51	49
Open range	210	7	8	44	11	280	.33	1.14	1.19	.13	.21	.34	68	32
Total	610	59	254	237	75	1,235	--	--	--	--	--	--	--	--

1/ Range within 1 mile of crop land.

In addition to the data given above, 323 fields and range areas in cropped land adjacent to range were sampled, with a total mean average of 1.13 pods per square-foot sample.

Table 3.--Grasshopper egg survey in idle land in 1938

Ratings	Stops made in--													
	Montana		Nebraska		N. Dak.		S. Dak.		Wyoming		Total		Adjacent to crop land	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1.0---------	48	25	1	2	37	23	45	38	3	14	134	25	92	28
1.1-2.0-----	48	25	2	5	34	22	21	18	2	10	107	20	50	16
2.1-3.0-----	43	22	15	34	30	19	29	24	7	33	124	23	73	23
3.1-4.0-----	31	16	16	36	31	20	20	17	8	38	106	20	61	19
4.1-5.0-----	25	12	10	23	26	16	4	3	1	5	66	12	47	14
Total----	195	100	44	100	158	100	119	100	21	100	537	100	323	100

Table 4.--Grasshopper egg survey in range land in 1938

Mean av. pods per square foot	Proportionate rating	Range stops					
		Adjacent range		Open range		Total	
		Number	Percent	Number	Percent	Number	Percent
0 - 0.2---	1	211	51	190	68	401	58
0.3 - 0.5-	2	126	30	49	18	175	25
0.6 - 1.0-	3	45	11	21	7	66	10
1.0 - 2.0-	4	17	4	14	5	31	4
2.0 - 15.0	5	15	4	6	2	21	3
Total---	--	414	100	280	100	694	100

Table 5.--Rangeland survey in 1938. Rangeland acreages classified as to infestation and tons of bait needed for control

Acreage surveyed	Montana	North Dakota	South Dakota	Wyoming	Total
1. Noneconomic-----	24,864,032	7,487,002	12,896,502	14,204,787	59,452,323
2. Light----------	10,905,277	3,075,018	5,843,727	5,770,695	25,594,717
3. Threatening-----	4,362,110	1,871,750	806,031	1,109,749	8,149,640
4. Severe----------	2,181,055	267,393	604,523	1,109,749	4,162,720
5. Very severe-----	1,308,633	668,482	0	0	1,977,115
Total--------	43,621,107	13,369,645	20,150,783	22,194,980	99,336,515
Total to poison (4 plus 5)--	3,489,688	935,875	604,523	1,109,749	6,139,835

Range land classified as to infestation in percentage of total acreages

Infestation	Montana	North Dakota	South Dakota	Wyoming
1. Noneconomic--	57	56	64	64
2. Light--------	25	23	29	26
3. Threatening--	10	14	4	5
4. Severe-------	5	2	3	5
5. Very severe--	3	5	0	0

Tables 1 to 5 show the results of the survey with Mr. Roberts' data summarized in table 1, and tables 2 to 5 giving a summary of all the surveyors. In table 2 the average number of egg pods per square foot in idle land is 1.08 and in cropped land adjacent it is 1.13, showing very little difference. In range land there is very little difference between the average infestations in open and adjacent range lands, but considerable difference between any of the range and the cropped or idle land. The infestations in the former were only about one-half to one-third as great as in the latter. The figures given in table 3 show that the percentages of adjacent crop-land areas falling into the 1 to 5 classes of infestation follow very closely the classification of idle land. Comparing such a classification of range land in table 4 with the idle land and cultivated crop in table 3, there is considerable difference. For example, 58 percent of the range can be considered as "noneconomic," or class 1, as it pertains to the migratory species M. mexicanus and its effect on crop land in the immediate vicinity. Only 25 percent of the idle land and 28 percent of the crop falls in this category. In the class 2, or "light," classification there falls 25 percent of the range, 20 percent of the idle land, and 16 percent of the crop land; in the class 3, or "threatening," 10 percent of the range, 23 percent of the idle land, and 23 percent of the crop; in the class 4, or "severe," 4 percent of the range, 20 percent of the idle land, and 19 percent of the crop land. In the class 5 or "very severe," 3 percent of the range, 12 percent of the idle land, and 14 percent of the crop land. This is all based on the number of areas and fields examined.

From the standpoint of estimating control needs on idle land, it could be considered the same as wheat stubble land, where in the average percentage of infestation for a county was applied to the total idle land acreage. Where infested, the egg pods of M. mexicanus are distributed throughout the field in a similar manner to wheat-stubble infestations and there would be little or no chance of their being plowed under before hatching.

In dealing with range land there was no criterion for making estimates of bait needs; therefore, in table 5 a table of percentages of range areas falling into each of the five classes of infestation was set up for each State. This was based on the actual numbers of areas examined in each State. Applying these percentages to the total acreages of range land in each State, classified the range land acreage into the five classes of infestation. From general observations, major migrations, whether by leg or wing, of M. mexicanus to crop land from range land in 1938 occurred in areas where the egg pods averaged over 1 pod per square foot, which means above a class 3 or "threatening" infestation. Therefore, any extra poisoned bait needed for protection from range land could be estimated by considering the acreages falling into the class 4 and class 5 infestations. For the entire area this means a total of 6,139,835 acres, which is 6 percent of the entire range area. It is also believed that only class 5 infestations with egg pods numbering above 2 per square foot will produce major flights to distant areas. Some 1,977,115 acres come into this classification.

In the North Dakota and South Dakota areas of most severe infestation, wherein the great flights of July 1938 originated, the number of egg pods in the 1937 fall survey averaged from 2 to 6 per square foot, with an occasional field averaging from 10 to 15 pods. These numbers of egg pods at an average of 20 eggs per pod would theoretically produce from 300 to 1,000 nymphs per square yard over large areas and, in some instances, from 1,500 to 3,000 per square yard. Estimated populations were reported as high as 8,000. For every 1 field of egg pods at the above rates, the active hoppers hatching from these places could spread over 6 to 60 times the area of the original breeding ground at a population of 50 per square yard. With many places like these, it is no wonder that the large flights developed and similar areas located in the 1938 survey might again produce major flights. Although populations of M. mexicanus in Michigan, Wisconsin, Iowa, and more eastern States may sometimes equal those in the Western Plains area, they do not seem to develop the migratorial habit to the extent that plains grasshoppers do. This greatly reduces the hazard from this species.

The Dissosteira longipennis area

On the Western Plains Dissosteira longipennis moved out to the more eastern and southeastern plains area of Colorado, spread over a wider area in the Panhandle of Texas, remained in about the same general area in northeastern New Mexico, occurred on the range land, also in the extreme northwestern third of the most western county in the Panhandle of Oklahoma, and is also an important crop hopper in the rest of the Panhandle area. Here the eggs of this species have been found along field margins, in windblown sand ridges, and in the listed rows of sorghum. When egg pods of D. longipennis occur in numbers over 1.5 pods per square foot they are usually in definite egg beds that are sometimes noticeable and sometimes not. These beds run from 1 to 100 acres in size. Some egg deposition occurs between the beds but the numbers of pods are usually 1 or less per square foot. For the most part the egg beds show severe damage to the grass cover, with the grass eaten short by ovipositing females. Spotting these egg beds is essential for good, efficient control of this species. One ranch of 6,000 acres in Union County, N. Mex., had already marked 36 beds of 3 to 10 acres in size. It is believed that approximately 6 percent of the general D. longipennis area contains some egg pods, with concentration on about a third of this. In the regular egg survey it is impossible to locate nearly all the egg beds and determine their acreage. Only the general areas of infestation can be defined and the acreages of these determined. For the entire D. longipennis area this amounted to 11,217,200 acres in the 1938 survey.

Species with lesser migratorial tendencies

Attention is called to the map entitled, "General Distribution of Economic Grasshoppers 1938 Survey," where symbols are used to denote the different species. Melanoplus differentialis is the most abundant in southeastern South Dakota, eastern Nebraska, and western Iowa. In Texas it is the dominant crop hopper other than D. longipennis. From the survey

it appears that this species is definitely building up in the south-central part of South Dakota, where in 1931 it destroyed a large portion of the crop in 30,000 square miles. In the egg survey, egg pods numbered as high as 150 per square foot in some places along field margins.

Melanoplus bivittatus is an important species scattered throughout the Great Plains States, but most numerous in parts of South Dakota, Wyoming, Colorado, and Nebraska.

Melanoplus packardii was rated as second in importance in most places where M. mexicanus was so numerous. Some of these may have been M. foedus, which is hardly distinguishable from M. packardii. Both of these species are noticed profusely throughout the Great Plains States in environments typically M. mexicanus.

Melanoplus femur-rubrum is most prominent in parts of Iowa, Wisconsin, Minnesota, Wyoming, Idaho, Utah, and Washington. It is the dominant species in the irrigated alfalfa of Idaho and Utah. Its distribution is very general.

Camnula pellucida is very important in localized areas in Nevada, Oregon, Washington, and Michigan. In the fall of 1938 it reached its greatest abundance in Nevada, where 350 pods per square foot were recorded at 1 stop.

Aeoloplus turnbullii, a common species, was recorded as dominant in four or five counties in the extreme western part of Kansas. It is an important species in sugar beets. Last spring it was found hatching in considerable numbers along the edges of fields in the irrigated sections around Garden City, Kans., and elsewhere. It is unusual for this species to be of such economic importance.

There were other species, such as Aulocara elliotti, Agenceotettix deorum, Brachystola magna, Dissosteira carolina, D. spurcata, Oedaleonotus enigma, Schistocerca sp., and others recorded as numerous and important but not to the extent of those already discussed.

The map has its limitations, because the subject matter is presented in such a graphic manner. The dominant species is considered first in the distribution, and the second in importance is shown occasionally. Where two or more species are of equal importance they are shown by an equal number of each of their symbols. Relative abundance is but roughly indicated in the numbers of each symbol and the map should not be taken too literally.

Effect of weather on the 1938 nymphal population

In all of the heavy rain areas of eastern Kansas and Nebraska, most of Missouri, Iowa, Illinois, and Wisconsin nymphal populations were kept down during the whole of the nymphal season because of rains. In many instances the infestations on the breeding grounds, which were mostly field margins, were reduced from 50 to 80 percent of the original population. No movements into the adjoining fields were recorded at such places.

In the entire area mentioned reductions in the grasshopper potential averaged from 25 to 50 percent.

Effect of egg predators on the infestations

In most of the M. mexicanus area proper egg predators, especially beefly larvae (Bombyliidae) have reduced the number of good eggs 20 to 75 percent, as recorded. The beefly occur in the greatest numbers in western North Dakota in the vicinity of Dickinson. They are not as numerous outside of the four M. mexicanus States as you go southward. Table 6 is a summary by States, of records made of the average number per square foot of each of the three egg predators found during the survey. These records were neither uniformly kept nor regularly recorded, so it was with difficulty that any semblance of a summary table was made. Blister beetle larvae were most important in Wyoming, North Dakota, Colorado, Nebraska, and Iowa, as recorded in the survey notes. Carabid larvae were generally numerous only in Iowa.

In the most severely infested areas of eastern South Dakota in 1938 where populations of active hoppers numbered in the thousands per square yard, the egg reduction by egg predators during the fall and winter of 1937 and 1938 amounted to less than 10 percent. In the Dickinson, N. Dak., area 1 flax field averaged 8 pods per square foot altogether, with 6 of those wholly or partially destroyed by beefly. If it were not for the beefly, the 8 pods per square yard would theoretically produce about 1,500 nymphs per square yard, which would equal some of the populations found in eastern South Dakota in June 1938. With the 75-percent destruction of eggs by beefly, as observed, the population cannot possibly number over 350 per square yard. This, of course, is still a heavy population but not uncommon in local outbreaks where in the past large migration has not been the factor that it was in July 1938. In other words, the enormous numbers of grasshoppers found in the summer of 1938 will not be so general or over so wide an area in 1939. Furthermore, the North Dakota-Montana areas are old established grasshopper areas and egg predators, especially beefly, are also well established. This probably accounts for their abundance in these places. It is also believed that with increased numbers of eggs comes a greater chance of egg predators finding the eggs and this includes skunks, field mice, horned larks, or any other creature that will feed on grasshopper eggs when it comes across them. There must be some degree of chance in the finding of egg pods by all these egg predators, and by increasing the number of eggs not only is the chance of finding them increased but the numbers of those taking part in the egg destruction, other than insect predators, is also increased. Therefore, the end result would be the product of the increased chance times the increased numbers of predators taking part in the egg destruction. For example, in light infestations a skunk or lark may accidentally dig up a pod but, where the infestations are heavy and the pods numerous and congregated, a single animal would feed on a much greater number of eggs and actually look for them. This all adds up to the fact that grasshopper populations do get cut down enormously, often suddenly.

Table 6.--Larvae of grasshopper-egg-pod predators found free in soil samples and in egg pods in 1938

State	Total fields samples				Data on fields where predators were found 1/								
	Number	Av. predators per sq.ft.			Bee flies			Blister beetles			Carabids		
		Bee flies	Blister beetles	Carabids	Fields	%	Av. per sq. ft.	Fields	%	Av. per sq. ft.	Fields	%	Av. per sq. ft.
M. mexicanus area:													
North Dakota	799	1.00	0.30	0.05	685	86	1.10	481	60	0.50	143	18	0.28
Wyoming	307	.52	.24	.06	91	30	1.76	159	52	.46	47	15	.38
South Dakota	924	.39	.26	.03	493	53	.73	362	39	.66	50	5	.46
Montana	979	.25	.17	.02	340	35	.73	276	28	.61	49	5	.34
Total	3,009	0.52	0.23	0.03	1,609	53	0.98	1,278	42	0.55	289	10	0.34
M.differentialis area:													
Oklahoma	282	0.37	0.29	0.11	87	31	1.21	105	37	0.77	62	22	0.83
Colorado	398	.34	.27	.08	234	59	.58	211	53	.51	89	22	.37
Kansas	708	.13	.13	.03	150	21	.62	149	21	.63	56	8	.39
Nebraska	542	.10	.29	.08	148	27	.36	267	49	.60	94	17	.48
Texas	445	.05	.27	.12	18	4	1.19	143	32	.83	50	11	1.08
Total	2,375	0.13	0.24	0.09	637	27	0.49	875	37	0.64	351	15	0.59
North Central-Lake area:													
Minnesota	380	0.09	0.06	0.05	103	27	0.33	66	17	0.34	67	18	0.27
Iowa	513	.03	.45	.12	81	16	.22	393	77	.58	233	45	.27
Total	893	0.06	0.28	0.09	184	21	0.28	459	51	0.55	300	34	0.27
Grand Total	6,277	0.31	0.24	0.06	2,430	39	0.80	2,612	42	0.58	940	15	0.41

1/ Eliminating fields with none.

ARKANSAS

This is the second year in which collections were made in Arkansas during the adult survey. There were 651 specimens collected in 4 environments in which 9 species were represented. The dominant species is Melanoplus differentialis, with M. femur-rubrum second in numbers. Fifty-one percent of the total specimens collected were nymphs, which probably were either first-generation M. femur-rubrum or second-generation M. mexicanus. In the 1937 collections M. mexicanus was dominant, with M. differentialis second in numbers and M. femur-rubrum third. Hatching began in March and continued throughout May and June. The worst infestations are in the counties along the Mississippi River.

Distribution by species of 651 specimens collected in Arkansas, expressed in percentage of total numbers collected in each habitat

Species	Alfalfa	Corn	Cotton	Grasses (miscellaneous)	Total specimens	Percentage of total
Chortophaga viridifasciata Deg.	--	--	--	0.81	3	0.46
Dissosteira carolina	--	3.22	--	--	2	.30
Hippiscus rugosus	--	3.22	--	--	2	.30
Melanoplus differentialis	57.75	61.29	47.11	10.84	194	29.80
M. femur-rubrum	2.58	1.61	15.38	12.19	65	9.98
M. mexicanus	5.17	--	1.92	.27	9	1.38
Orphulella speciosa	--	--	--	.27	1	.15
Schistocerca americana	.86	9.67	5.76	2.16	21	3.22
Syrbula admirabilis	1.72	--	.96	7.04	29	4.45
Nymphs	31.89	20.96	28.84	66.39	325	49.92
Total specimens per environment	116	62	104	369	651	--

ARKANSAS

The percentages of individuals of the various species present in Arkansas, arranged according to crops infested, are summarized as follows:

Alfalfa		Percent
1.	Melanoplus differentialis	58
2.	M. mexicanus	5
3.	M. femur-rubrum	3
4.	Syrbula admirabilis	2
5.	Schistocerca americana	1
6.	Other species and unident.	0
7.	Nymphs	31

Corn		Percent
1.	Melanoplus differentialis	62
2.	Schistocerca americana	10
3.	Hippiscus rugosus	3
4.	Dissosteira carolina	3
5	Other species and unident.	0
6.	Nymphs	22

Cotton		
1.	Melanoplus differentialis	47
2.	M. femur-rubrum	15
3.	Schistocerca americana	6
4.	M. mexicanus	2
5.	Syrbula admirabilis	1
6.	Other species and unident.	0
7.	Nymphs	29

Grasses, miscellaneous		
1.	Melanoplus femur-rubrum	12
2.	M. differentialis	11
3.	Syrbula admirabilis	7
4.	Schistocerca americana	2
5.	Chortophaga viridifasciata	1
6.	Other species (2) and unident.	1
7.	Nymphs	66

Summary

		Percent
1.	Melanoplus differentialis	30
2.	M. femur-rubrum	10
3.	Syrbula admirabilis	4
4.	Schistocerca americana	3
5.	M. mexicanus	1
6.	Other species and unident.	1
7.	Nymphs	51

COLORADO

This is the fourth year in which collections were made in Colorado during the adult survey. In the 1938 survey 10,278 specimens were collected in 10 different environments. Disregarding Dissosteira longipennis in the southeastern quarter of the State, there were 6 species of major importance. Melanoplus mexicanus was first, at 16 percent of the total number collected; M. differentialis and M. femur-rubrum both at 11 percent; M. bivittatus at 10 percent; M. lakinus at 8 percent; and Aeoloplus turnbullii turnbullii and A. turnbullii bruneri together at 6 percent. On the range land M. mexicanus was the most numerous species other than D. longipennis. It was also dominant in small grain, corn, sorghums, and restoration or idle land. There is no doubt that M. mexicanus has increased in relative numbers in 1938 over some of the other species, although there is no marked change in the relative abundance of the important species.

Hatching of D. longipennis was first observed on April 29, and M. differentialis and M. bivittatus about May 15, continuing until the last week of June. Flights of D. longipennis began the last week of June and continued until about the first of October. The general movement was eastward, and the 1938 surveys indicate that the infestations are again occupying about the same areas as in 1937. The hopper infestations in crops are as heavy or heavier in the irrigated sections in the 1938 fall survey as they were in the 1937 survey. Notwithstanding a conservative estimate of a population reduction of 75 percent for D. longipennis during the 1938 season, the problem still remains about the same. The explanation for this lies in the fecundity of the grasshoppers, which enables them to build up again within one season. About 4,500,000 acres is included in the general areas of the D. longipennis infestations.

Distribution by species of 10,278 specimens collected in Colorado, expressed in percentage of total numbers collected in each habitat

Species	Small grain	Corn sorghum	Alfalfa	Sugar beets	Beans	Weedy places	Range	Bottom grass	Mt. meadow	Field margins	Miscellaneous	Total specimens	% of total
Acrolophitus hirtipes Say------	0.12	--	--	--	--	--	--	--	--	--	--	2	0.02
Aeoloplus lacinnus----------	--	--	--	--	0.82	--	--	--	--	--	--	2	.02
A. turnbullii bruneri Caud.----	4.70	6.16	1.15	7.76	1.64	11.83	12.59	0.83	--	4.40	--	599	5.81
A. turnbullii turnbullii Thos.-	--	.42	--	--	--	3.80	.99	--	--	--	--	71	.69
Aeropedellus clavatus Thos.----	--	--	--	--	--	--	--	--	1.36	--	--	2	.02
Ageneotettix deorum Scudd.-----	1.45	.14	.15	.17	1.23	.80	1.43	2.64	--	1.20	--	90	.87
Amphitornus coloradus Thos.----	--	--	--	--	--	.07	.56	.17	--	1.00	--	16	.16
Arphia pseudonietana Thos.-----	.17	--	--	--	--	--	.50	.99	--	--	--	17	.16
Aulocara elliotti Thos.--------	4.87	1.12	.44	--	.82	2.56	4.15	2.97	5.44	--	--	234	2.27
Boopedon nubilum Say----------	.17	.70	.15	--	--	--	--	7.26	--	--	--	56	.54
Brachystola magna Gir.--------	.12	--	.07	--	--	.15	.25	--	--	.40	--	12	.12
Camnula pellucida Scudd.------	--	--	--	--	--	--	--	--	25.84	--	--	38	.37
Chortippus longicornis Latr.---	--	--	--	--	--	--	--	.17	--	--	--	1	.01
Cordillacris crenulata Brun.---	1.10	--	--	--	--	--	.56	--	--	--	--	28	.27
C. occipitalis Thos.----------	.70	--	--	--	--	--	1.74	--	--	--	--	40	.39
Cratypedes neglectus Thos.-----	.06	--	--	--	--	--	--	--	--	--	--	1	.01
Dactylotum pictum Thos.--------	--	--	--	--	--	--	--	--	--	1.80	--	9	.09
Derotmema haydenii Thos.------	1.45	--	.11	.17	--	.95	1.36	.33	1.36	.80	--	72	.70
Dissosteira carolina L.-------	.17	.42	.11	--	--	.07	.06	--	--	--	--	11	.11
D. longipennis Thos.----------	1.62	2.80	--	.50	1.23	1.02	3.97	--	6.12	.40	--	143	1.39
Drepanopterna femoratum Scudd.-	.46	.14	.04	--	--	.29	.31	2.48	--	--	--	34	.33
Encoptolophus sordidus costalis Scudd.----------	.12	--	.44	.17	--	--	--	6.11	--	--	--	52	.50
Hadrotettix trifasciatus Say---	.29	.42	.22	.50	--	.51	.56	.66	--	--	--	37	.36
H. speciosus Scudd.----------	.41	1.82	.30	.33	12.30	3.58	.06	1.49	--	4.80	--	143	1.39
H. viridis Thos.--------------	.23	--	--	--	--	.07	.68	--	--	--	--	16	.16
Hippiscus rugosus Scudd.------	--	--	--	--	--	---	--	.50	--	.20	--	4	.04
Hypochlora alba Dodge---------	--	--	--	--	--	--	.37	.33	--	--	--	8	.08
Melanoplus angustipennis Dodge-	1.74	3.36	.78	.83	1.64	2.99	6.01	2.81	--	2.20	--	250	2.43
M. bivittatus Say-------------	12.35	12.88	12.58	18.48	9.43	8.32	.56	7.26	4.76	6.40	27.44	1000	9.70

Species	Small grain	Corn sorghum	Alfalfa	Sugar beets	Beans	Weedy places	Range	Bottom grass	Mt. meadow	Field margins	Miscellaneous	Total specimens	% of total
Melanoplus bowditchi Scudd.	1.80	3.92	.85	1.00	.41	.58	3.47	--	--	.60	--	156	1.51
M. confusus Scudd.	--	--	--	--	--	--	.06	--	--	--	--	1	.01
M. dawsoni Scudd.	--	--	--	--	--	--	.06	--	--	--	--	1	.01
M. differentialis Thos.	10.44	17.78	14.43	30.86	20.50	6.35	2.54	2.15	--	5.60	58.80	1133	10.99
M. femur-rubrum Deg.	5.57	2.52	20.50	13.53	6.97	11.32	.43	12.38	.68	16.20	--	1086	10.53
M. foedus foedus Scudd.	5.34	8.96	2.07	.50	--	6.42	9.05	.99	--	1.60	--	463	4.49
M. gladstoni Scudd.	.81	.14	.19	--	.82	.73	.99	.50	--	.20	--	52	.50
M. infantilis Scudd.	.23	--	--	--	--	.15	.56	--	.68	--	--	16	.16
M. lakinus Scudd.	6.67	5.74	10.43	9.90	8.20	10.88	1.18	.99	--	25.20	7.84	822	7.97
M. mexicanus Sauss.	21.00	21.84	14.10	4.46	19.27	19.86	20.89	8.25	6.12	3.80	1.96	1661	16.11
M. occidentalis Thos.	.06	--	--	.33	--	.58	1.24	--	11.56	--	--	48	.47
M. packardii Scudd.	5.28	2.38	1.30	.17	11.89	3.14	2.48	3.47	.68	5.00	--	303	2.94
M. regalis Dodge	.12	--	--	--	--	.15	.06	.17	.68	4.20	--	28	.27
M. s. scudderi Uhl.	--	--	--	--	--	--	--	--	--	.20	--	1	.01
Mermiria maculipennis Rehn	--	--	--	--	--	--	--	2.31	--	2.80	--	28	.27
M. maculipennis macclungi Rehn	.29	.14	.11	--	--	.15	3.19	4.62	--	5.00	--	67	.65
Mestobregma sp.	--	--	--	--	--	--	--	.17	--	--	--	1	.01
Metator pardalinus Sauss.	.29	--	--	--	--	--	.12	--	1.36	--	--	9	.09
Opeia obscura Thos.	.46	--	--	--	--	.22	.12	1.82	--	.60	--	27	.26
Orphulella pelidna Burm.	--	--	--	--	--	.07	--	3.96	--	--	--	25	.24
O. speciosa Scudd.	--	--	--	--	--	--	.18	--	--	--	--	3	.03
Paropomala wyomingensis Thos.	.06	--	--	--	--	--	.06	--	--	1.80	--	11	.11
Philibostroma quadrimaculatum Thos.	2.15	--	--	--	--	--	3.16	3.47	2.04	.40	--	114	1.11
Phoetaliotes nebrascensis Thos.	.17	--	.04	--	--	--	--	10.40	--	1.80	--	76	.74
Psoloessa d. delicatula Scudd.	--	--	--	--	--	--	--	--	1.36	--	--	2	.02
Schistocerca lineata Scudd.	--	.42	--	--	--	--	--	--	--	--	--	3	.03
Spharagemon collare Scudd.	.58	1.68	.63	.17	.41	.22	.74	.50	2.04	.40	--	64	.62
S. equale Say	.17	.28	.04	--	--	--	.37	--	--	--	--	12	.12
Trachyrhachis kiowa kiowa Thos.	.70	--	.04	--	--	.15	2.79	4.46	8.16	--	--	99	.96
Trachyrhachis sp.	--	--	--	--	--	--	.31	--	--	--	--	5	.05

COLORADO (Continued)

Species	Small grain	Corn sorghum	Alfalfa	Sugar beets	Beans	Weedy places	Range	Bottom grass	Mt. meadow	Field margins	Miscellaneous	Total specimens	% of total
Trimerotropis agrestis McN.	--	--	--	--	--	--	.12	--	--	--	--	2	.02
T. laticincta Sauss.	.17	--	.04	.17	--	.29	1.74	--	--	.20	--	36	.37
T. pallidipennis Burm.	.46	.14	.48	--	--	.44	--	--	--	--	--	28	.27
T. formosus Say	--	--	--	--	--	--	.12	--	--	--	--	2	.02
Xanthippus corallipes Hald.	--	--	--	--	--	--	--	--	2.04	--	--	3	.03
Undetermined species	.46	.42	.04	1.16	--	.15	.62	.33	3.40	--	--	38	.37
Nymphs	3.48	2.80	19.06	8.75	1.64	1.31	9.61	2.15	13.60	.40	3.92	862	8.36
Total specimens per environment	1,708	711	2726	605	242	1,372	1,613	606	146	498	51	10278	--

COLORADO

The percentages of individuals of the various species present in Colorado, arranged according to crops infested, are summarized as follows:

Small grain	Percent	Alfalfa	Percent
1. Melanoplus mexicanus	21	1. Melanoplus femur-rubrum	20
2. M. bivittatus	12	2. M. differentialis	14
3. M. differentialis	10	3. M. mexicanus	14
4. M. lakinus	7	4. M. bivittatus	13
5. M. femur-rubrum	6	5. M. lakinus	10
6. 37 other sp. and undet.	40	6. 23 other sp. and undet.	10
7. Nymphs	4	7. Nymphs	19

Corn and sorghums		Sugar beets	
1. Melanoplus mexicanus	22	1. Melanoplus differentialis	31
2. M. differentialis	18	2. M. bivittatus	18
3. M. bivittatus	13	3. M. femur-rubrum	13
4. M. foedus foedus	9	4. M. lakinus	10
5. Aeoloplus turnbullii bruneri	6	5. Aeoloplus turnbullii bruneri	8
6. 20 other sp. and undet.	29	6. 14 other sp. and undet.	11
7. Nymphs	3	7. Nymphs	9

Beans		Range	
1. Melanoplus differentialis	21	1. Melanoplus mexicanus	21
2. M. mexicanus	19	2. Aeoloplus turnbullii bruneri	12
3. Hesperotettix speciosus	12	3. M. foedus foedus	9
4. M. packardii	12	4. M. angustipennis	6
5. M. bivitattus	10	5. Aulocara elliotti	4
6. 11 other sp.	24	6. 41 other sp. and undet.	38
7. Nymphs	2	7. Nymphs	10

Restoration (weedy)		Bottom grass	
1. Melanoplus mexicanus	20	1. Melanoplus femur-rubrum	13
2. Aeoloplus turnbullii bruneri	12	2. Phoetaliotes nebrascensis	11
3. M. femur-rubrum	11	3. M. mexicanus	8
4. M. lakinus	11	4. M. bivittatus	7
5. M. bivittatus	8	5. Boopedon nubilum	7
6. 41 other sp. and undet.	37	6. 28 other sp. and undet.	52
7. Nymphs	1	7. Nymphs	2

COLORADO (Cont'd).

Mountain meadow	Percent
1. Cannula pellucida	26
2. Melanoplus occidentalis	12
3. Trachyrhachis kiowa kiowa	8
4. M. mexicanus	6
5. Dissosteira longipennis	6
6. 13 other sp. and undet.	28
7. Nymphs	14

Field margin	Percent
1. Melanoplus lakinus	25
2. M. femur-rubrum	16
3. M. bivittatus	6.5
4. M. differentialis	6
5. M. packardii	5
6. 24 other sp.	41
7. Nymphs	0.5

Miscellaneous	Percent
1. Melanoplus differentialis	59
2. M. bivittatus	27
3. M. lakinus	8
4. M. mexicanus	2
5. Nymphs	4

Grand total	
1. Melanoplus mexicanus	16
2. M. differentialis	11
3. M. femur-rubrum	11
4. M. bivittatus	10
5. M. lakinus	8
6. 60 other sp. and undet.	36
7. Nymphs	8

IDAHO

This is the first year that collections were made in Idaho during the adult survey. For the most part, the collections were confined to an area where the natural vegetation was originally sagebrush designated as the northern desert shrub area. The most important sagebrush is Artemisia tridentata, which ranges in height from 2 to 7 feet. Other common plants are little rabbitbrush (Chrysothamnus stenophyllus), matchweed (Gutierrezia sarothrae), and others. One of the most common grasses is an introduced annual brome, Bromus tectorum, commonly called downy bromegrass. Crops are mostly in irrigated sections with seed alfalfa, a most important crop. This suffers from invasions from the adjacent rangeland grasshopper infestations, even when such infestations are comparatively light.

Melanoplus femur-rubrum was the dominant species in the 305 specimens collected. A collection of this size for a State is too small upon which to base any conclusions. M. mexicanus formed half of a small collection made in alfalfa. Hatching began the first week of May and subsequent unfavorable weather conditions delayed and prolonged it. Infestations originated to some extent in downy bromegrass. Infestations are on the increase and follow the irrigated farm areas.

Distribution by species of 305 specimens collected in Idaho, expressed in percentage of total numbers collected in each habitat

Species	Idle land	Alfalfa	Meadow, pasture and hay	Dry swamp	Total specimens	Percentage of total
Camnula pellucida	--	21.62	18.29	30.76	54	17.70
Chortippus longicornis	--	--	26.21	23.07	49	16.06
Conoza sp.	2.43	--	--	--	1	0.32
Dissosteira carolina	2.43	--	--	--	1	0.32
D. spurcata	2.43	--	--	--	1	0.32
Melanoplus bivittatus	--	5.40	--	3.84	5	1.63
M. devastator	4.87	--	0.60	--	3	0.98
M. femur-rubrum	--	6.75	50.00	38.46	98	32.13
M. foedus foedus	7.31	12.16	--	--	12	3.93
M. mexicanus	36.58	50.00	4.87	--	60	19.67
Oedaleonotus enigma Scudd.	41.46	2.70	--	--	19	6.22
Phoetaliotes nebrascensis	2.43	--	--	--	1	0.32
Undetermined	--	1.35	--	--	1	0.32
Total specimens per environment	41	74	164	26	305	--

IDAHO

The percentages of individuals of the various species present in Idaho, arranged according to crops infested, are summarized as follows:

Idle land	Percent
1. Oedaleonotus enigma	41
2. Melanoplus mexicanus	37
3. M. foedus foedus	7
4. M. devastator	5
5. Dissosteira carolina	2
6. Other species (3) and unident.	8
7. Nymphs	0

Alfalfa	Percent
1. Melanoplus mexicanus	50
2. Camnula pellucida	22
3. Melanoplus foedus foedus	12
4. M. femur-rubrum	7
5. M. bivittatus	5
6. Other species and undeter.	4
7. Nymphs	0

Meadow, pasture, and hay	
1. Melanoplus femur-rubrum	50
2. Chortippus longicornis	26
3. Camnula pellucida	18
4. Melanoplus mexicanus	5
5. M. devastator	1
6. Other species	0
7. Nymphs	0

Dry swamp	
1. Melanoplus femur-rubrum	40
2. Camnula pellucida	32
3. Chortippus longicornis	24
4. Melanoplus bivittatus	4
5. Other species	0
6. Nymphs	0

Summary

	Percent
1. Melanoplus femur-rubrum	33
2. M. mexicanus	20
3. Camnula pellucida	18
4. Chortippus longicornis	16
5. Oedaleonotus enigma	8
6. Other species and unident.	5
7. Nymphs	0

ILLINOIS

This is the first year in which collections were made in this State during the adult survey. The original natural vegetation areas of Illinois were the tall-grass prairies and the oak-hickory southern hardwood forest along the rivers and streams. As in Iowa and other tall-grass prairie States, the original vegetation areas have been changed by the introduction of agriculture and attendant changes in topography and flora. As a rule, grasshoppers do not flourish to the extent they do out West in the Great Plains States. There were 5,539 specimens collected, representing some 24 species in 8 different environments. Melanoplus femur-rubrum was the most important species in all the environments, with the exception of cornfields and waste places. In the latter, M. differentialis was dominant. For the entire State collection, M. femur-rubrum was first in numbers at 21 percent; M. differentialis second at 9 percent; and M. mexicanus third at 6 percent.

A small percentage of hatch had occurred in the southern part of the State by the first of May. Frequent heavy rains retarded hatching and reduced populations so that damage was negligible in almost every county. Some late damage occurred from adults. There are two areas of infestation; one in the northern tier of counties and one in the mid-western part of the State. Normal rainfall conditions will probably hold these in check.

Distribution by species of 5,539 specimens collected in Illinois, expressed in percentage of total number collected in each habitat

Species	Percentage collected in--								Total specimens	Percentage of grand total
	Graded roadside	Legumes	Pasture grassland	Small grain	Waste farm land	Tame hay crops	Corn	Wooded pasture		
Ageneotettix deorum deorum	0.31	--	0.27	--	2.13	--	--	--	19	0.34
Arphia sulphurea (F.)	.23	0.24	--	--	--	0.42	--	--	7	.13
A. xanthoptera (Burm.)	.08	--	--	--	--	--	--	--	1	.02
Campylocantha olivacea olivacea Scudd.	.08	.65	--	1.04	.36	.85	0.89	--	23	.42
Chloealtis conspersa Harr.	.08	--	--	--	--	--	--	--	1	.02
Chortippus longicornis	.08	--	--	--	.71	--	--	--	5	.09
Chortippus viridifasciata	.77	1.29	1.87	1.73	1.42	2.12	.89	--	76	1.37
Dichromorpha viridis Scudd.	.38	.24	--	.35	.18	--	1.79	1.05	15	.27
Dissosteira carolina	.54	.32	.18	.46	--	--	.89	1.05	19	.34
Hesperotettix viridis	.15	--	--	.23	.18	--	--	--	5	.09
Hippiscus rugosus	.77	.65	2.31	.46	.36	--	--	3.16	53	.96
Hypochlora alba	.08	--	--	--	--	--	--	--	1	.02
Melanoplus angustipennis	--	.40	.18	.12	1.07	--	--	--	14	.25
M. bivittatus	--	--	.18	--	--	--	.89	--	3	.05
M. differentialis	9.29	12.76	2.40	5.88	11.90	6.36	37.50	6.32	487	8.79
M. femur-rubrum	21.03	23.18	13.24	27.10	9.41	35.17	16.96	64.21	1161	20.96
M. mexicanus	2.23	10.42	4.36	11.42	3.37	1.69	2.68	2.11	334	6.03
Mermiria maculipennis macclungi	--	--	--	--	.18	--	--	--	1	.02
Orphulella speciosa	.69	.65	3.20	.23	.18	1.69	--	2.11	62	1.12
Schistocerca alutacea Harr.	.15	--	.09	--	1.78	--	--	--	13	.23
S. americana americana (Drury)	1.00	1.21	.18	1.04	2.13	.42	.89	--	53	.96
Spharagemon collare	--	.16	.09	--	.18	--	--	--	4	.07
Syrbula admirabilis Uhler	1.38	.24	5.24	.35	1.07	--	--	2.11	91	1.64
Trachyrhachis kiowa fuscifrons Stal	.69	.32	.36	.35	.18	--	--	--	21	.38
Nymphs	60.01	47.25	65.86	49.25	63.23	51.27	36.61	17.89	3070	55.41
Total specimens per environment	1,303	1,238	1,125	867	563	236	112	95	5,539	--

ILLINOIS

The percentages of individuals of the various species present in Illinois, arranged according to crops infested, are summarized as follows:

Graded roadside	Percent
1. Melanoplus femur-rubrum	21
2. M. differentialis	9
3. M. mexicanus	2
4. Syrbula admirabilis	1
5. Schistocerca a. americana	1
6. 15 other species	66
Nymphs - 60	

Legumes	Percent
1. Melanoplus femur-rubrum	23
2. M. differentialis	13
3. M. mexicanus	10
4. Chortippus viridifasciata	1
5. Schistocerca a. americana	1
6. 10 other species	52
Nymphs - 47	

Pasture grassland	
1. Melanoplus femur-rubrum	13
2. Syrbula admirabilis	5
3. M. mexicanus	4
4. Orphulella speciosa	3
5. M. differentialis	2
6. 10 other species	73
Nymphs - 66	

Small grain	
1. Melanoplus femur-rubrum	27
2. M. mexicanus	11
3. M. differentialis	6
4. Chortippus viridifasciata	2
5. Campylocantha o. olivacea	1
6. 9 other species	53
Nymphs - 49	

Waste farmland	
1. Melanoplus differentialis	12
2. M. femur-rubrum	9
3. M. mexicanus	3
4. Schistocerca a.americana	2
5. Ageneotettix d. deorum	2
6. 13 other species	72
Nymphs - 63	

Tame-hay crops	
1. Melanoplus femur-rubrum	35
2. M. differentialis	6
3. Chortippus viridifasciata	2
4. M. mexicanus	2
5. Orphulella speciosa	2
6. 3 other species	53
Nymphs - 51	

Corn	
1. Melanoplus differentialis	38
2. M. femur-rubrum	17
3. M. mexicanus	3
4. Dichromorpha viridis	2
5. Campylocantha o. olivacea	1
6. 4 other species	39
Nymphs - 37	

Wooded pasture	
1. Melanoplus femur-rubrum	64
2. M. differentialis	6
3. Hippiscus rugosus	3
4. M. mexicanus	2
5. Orphulella speciosa	2
6. 3 other species	23
Nymphs - 18	

Percentage of grand total

1. Melanoplus femur-rubrum	21
2. M. differentialis	9
3. M. mexicanus	6
4. Syrbula admirabilis	2
5. Chortippus viridifasciata	1
6. 19 other species	61
Nymphs - 55	

IOWA

This is the fourth year in which collections were made in Iowa in the adult survey. Collections have been made in 1935, 1936, 1937, and 1938. In 1936 the specimens were boxed up ready for shipment and allowed to lie around the insectary, and mice destroyed the lot. This is written in as a warning that mice will do this to dried grasshopper specimens, and proper care must be taken to prevent it. It has happened at the Bozeman, Mont., laboratory and means simply a wasted effort on the part of the collector and lost information on the part of the grasshopper survey.

There were 11,853 specimens collected in 8 major environments and 29 species were represented. Undetermined nymphs made up 40 percent of the total collection and most of these were probably Melanoplus femur-rubrum. The dominant species in the collections was M. femur-rubrum, not including nymphs. M. mexicanus and M. differentialis were second in numbers. In the legumes and pastures M. femur-rubrum was most numerous, whereas in corn M. differentialis was by far the most important grasshopper. It must be understood, however, that these collections are made rather late in the season, and some portion of the early maturing species, like M. mexicanus and M. bivittatus, may have finished their life cycle and gone. M. femur-rubrum is a very late-maturing species and adults of these hardly show up before July 15, but would be numerous in collections made in August. There has been some great change in the relative numbers of specimens collected in 1937 and 1938. M. femur-rubrum was not of such great importance in 1938 as in 1937. M. differentialis, on the other hand, has increased its relative percentage of total number specimens collected from 5 percent in 1937 to 13 percent in 1938, and in corn from 31 to 52 percent. It has approximately doubled its relative importance in all environments.

Hatching of M. mexicanus and M. bivittatus began the last week of April, with heavy rains prolonging the hatch all through May and part of June. M. differentialis did not begin hatching until about the first of June. Continued rains held infestations in check and reduced the nymphal populations from 50 to 80 percent of their possible numbers. In fact the grasshopper potential for the entire State was reduced to one-half of what it was in the 1937 survey. There were some second-generation of M. mexicanus but not as many as in 1937. The outlook for next year is about half as serious, with the greatest losses to be expected from M. differentialis.

Distribution by species of 11,853 specimens collected in Iowa, expressed in percentage of total number collected in each habitat

Species	Percentage collected in--								Total specimens	% of grand total
	Legumes	Roadside	Pasture grass land	Small grain	Idle land	River bottom	Corn	Woody patches		
Ageneotettix d. deorum	1.23	1.31	9.36	3.75	1.41	0.60	0.56	1.50	343	2.89
Arphia pseudonietana	--	--	.05	--	--	--	--	--	1	.01
A. simplex Scudd.	--	--	--	--	.30	--	--	--	3	.03
A. sulphurea	--	.12	.05	.07	--	--	--	--	5	.04
Aulocara elliotti	--	--	.05	--	--	--	--	--	1	.01
Chortippus longicornis	--	--	.05	--	--	--	--	--	1	.01
Dichromorpha viridis	--	.20	.15	.07	--	--	.28	--	10	.08
Dissosteira carolina	.19	.40	.20	.63	.20	.81	--	--	36	.30
Encoptolophus sordidus sordidus Burm.	.03	.04	.15	--	.10	--	.28	--	7	.06
Hesperotettix speciosus	--	--	.05	--	1.00	--	--	--	11	.09
H. viridis	--	.32	--	--	--	--	.28	--	9	.08
Hippiscus rugosus	.03	--	.60	.14	.40	--	--	--	19	.16
Melanoplus bivittatus	2.92	7.33	2.16	5.07	4.72	10.48	19.44	17.07	634	5.34
M. differentialis	11.70	15.17	5.79	10.42	10.04	16.94	52.39	12.28	1494	12.59
M. femur-rubrum	20.93	22.10	31.50	19.25	33.53	13.10	7.04	17.96	2724	22.96
M. keeleri luridus Dodge	.03	--	--	--	1.81	--	--	--	19	.16
M. mexicanus	10.73	6.65	8.91	35.58	17.07	7.86	9.01	21.56	1570	13.24
M. packardii	.24	.20	.25	.21	.10	.20	--	--	24	.20
M. s. scudderi	--	--	--	--	--	--	--	.90	3	.03
Mermiria maculipennis macclungi	--	--	.65	--	--	--	--	--	13	.11
Orphulella speciosa	.05	.04	5.59	.28	.80	--	--	--	126	1.06
Pardalophora haldemanii Scudd.	--	--	.10	--	--	--	--	--	2	.02
Phoetaliotes nebrascensis	.03	--	.05	.07	--	.20	.28	--	5	.04
Schistocerca a. americana	--	.04	--	--	--	--	--	--	1	.01
S. lineata	--	--	--	--	--	--	--	.30	1	.01
Spharagemon collare	.03	--	--	--	--	--	--	--	1	.01
Syrbula admirabilis	--	.12	.10	--	.20	--	--	--	7	.06
Trachyrhachis kiowa fuscifrons	--	.08	--	--	--	--	--	--	2	.02
T. kiowa kiowa	.03	.08	.35	.14	--	--	--	--	12	.10
Nymphs	51.83	45.79	33.82	24.32	28.31	49.80	10.42	28.44	4769	40.20
Total specimens per environment	3,735	2,511	1,987	1,439	996	496	355	334	11,853	--

IOWA

The percentages of individuals of the various species present in Iowa, arranged according to crops infested, are summarized as follows:

Legumes

		Percent
1.	Melanoplus femur-rubrum	21
2.	M. differentialis	12
3.	M. mexicanus	11
4.	M. bivittatus	3
5.	Ageneotettix d. deorum	1
6.	9 other species	52
	Nymphs - 52	

Roadside

		Percent
1.	Melanoplus femur-rubrum	22
2.	M. differentialis	15
3.	M. bivittatus	7
4.	M. mexicanus	7
5.	Ageneotettix deorum	1
6.	11 other species	48
	Nymphs - 46	

Pasture grassland

1.	Melanoplus femur-rubrum	32
2.	Ageneotettix deorum	9
3.	M. mexicanus	9
4.	M. differentialis	6
5.	Orphulella speciosa	6
6.	16 other species	38
	Nymphs - 34	

Small grain

1.	Melanoplus mexicanus	36
2.	M. femur-rubrum	19
3.	M. differentialis	10
4.	M. bivittatus	5
5.	Ageneotettix deorum	4
6.	8 other species - 26	

Idle land

1.	Melanoplus femur-rubrum	34
2.	M. mexicanus	17
3.	M. differentialis	10
4.	M. bivittatus	5
5.	M. keeleri luridus	2
6.	9 other species	32
	Nymphs - 28	

River bottom

1.	Melanoplus differentialis	17
2.	M. femur-rubrum	13
3.	M. bivittatus	10
4.	M. mexicanus	8
5.	Dissosteira carolina	1
6.	3 other species	51
	Nymphs - 50	

Corn

1.	Melanoplus differentialis	52
2.	M. bivittatus	19
3.	M. mexicanus	9
4.	M. femur-rubrum	7
5.	Ageneotettix deorum	1
6.	4 other species	12
	Nymphs - 10	

Woody patches

1.	Melanoplus mexicanus	22
2.	M. femur-rubrum	18
3.	M. bivittatus	17
4.	M. differentialis	12
5.	Ageneotettix deorum	2
6.	2 other species	29
	Nymphs - 28	

Percentage of grand total

1.	Melanoplus femur-rubrum	23
2.	M. mexicanus	13
3.	M. differentialis	13
4.	M. bivittatus	5
5.	Ageneotettix deorum	3
6.	24 other species	43
	Nymphs - 40	

KANSAS

This is the second year in which collections were made in the State during the adult survey. There were 10,355 specimens collected in 8 different environments and 52 species are represented. In alfalfa, small grains, and pasture land Melanoplus mexicanus was the most numerous of all species, whereas in corn and sorghums M. differentialis was first in numbers and M. bivittatus second. M. Mexicanus was dominant for the State collection as a whole. Several big changes have taken place between the 1937 and 1938 infestations in regard to the relative abundance of the different species. In 1937 Cordillacris crenulata was first on the range land, at 60 percent of the specimens collected, and ranked third in the total number collected. In the 1938 collection, only 1 specimen was collected in the total of 10,355. A similar change in the relative numbers of this species occurred in Nebraska in 1938 and in Montana between 1935 and 1936. There was also a definite increase in the relative numbers of Acoloplus turnbullii from 1.5 percent of the total specimens collected in 1937 to 5.9 percent of the total in 1938.

Some reports of hatching came in the first week of April and by the end of the month hatching was general over the State. Rains retarded hatching and greatly reduced populations, especially in the eastern counties. No major flights occurred in the State. The western part still has the heaviest infestations, although most of them do not exceed a class 3, or "threatening," condition.

Distribution by species of 10,335 specimens collected in Kansas, expressed in percentage of total number collected in each habitat

Species	Percentage collected in --								Total specimens	Percentage of grand total
	Small grain	Pasture	Legumes	Sorghums	Corn	Weeds	Roadside	Coulee bottom		
Aeoloplus turnbullii bruneri	8.72	4.18	0.91	6.38	1.60	42.00	11.81	--	613	5.93
Ageneotettix deorum	1.09	10.18	.86	.35	2.40	--	1.05	0.63	319	3.08
Amphitornus coloradus	--	.08	--	--	--	--	--	--	2	.02
Arphia conspersa Scudd.	--	.04	--	--	--	--	--	--	1	.01
Arphia simplex Scudd.	--	--	.05	--	--	--	--	--	1	.01
Aulocara elliotti	1.59	4.90	.09	.28	.34	.67	.42	--	167	1.61
Boopedon maculatum Caud.	--	.17	--	--	--	--	--	--	4	.04
B. nubilum	.04	2.03	.09	.07	--	--	.42	--	54	.52
Brachystola magna	--	.04	--	--	--	.67	.21	--	4	.04
Chortophaga viridifasciata	.04	--	--	--	--	--	--	--	1	.01
Cordillacris crenulata	--	.04	--	--	--	--	--	--	1	.01
Derotmema haydenii	.13	--	--	.35	--	1.00	--	--	11	.11
Dissosteira carolina	.55	.04	.14	.35	--	1.00	.21	--	26	.25
Dissosteira longipennis	.25	.42	.05	1.06	--	.33	.21	--	34	.33
Drepanopterna femoratum Scudd.	--	.04	--	--	--	--	--	--	1	.01
Hadrotettix trifasciatus	.08	.04	.05	.07	.11	.33	--	--	7	.07
Hesperotettix speciosus	.50	.80	--	.14	1.03	--	4.85	42.90	201	1.94
Hesperotettix viridis	--	.17	--	--	.68	--	.21	.95	14	.14
Hippiscus rugosus	--	.13	.05	--	.11	--	.21	--	6	.06
Hypochlora alba	--	.13	--	--	--	--	--	1.58	8	.08
Melanoplus angustipennis	.55	--	.23	.07	--	--	.21	.63	22	.21
M. bivittatus	10.40	4.64	15.91	24.04	21.35	2.67	16.03	15.46	1368	13.23
M. bowditchi	--	--	.05	--	--	--	--	--	1	.01
M. differentialis	7.93	3.84	16.23	32.34	38.93	7.00	33.33	21.45	1682	16.26
M. femur-rubrum	.34	1.22	.63	.21	1.14	.67	1.27	--	72	.70
M. flavidus flavidus Scudd.	--	--	--	--	.11	--	--	--	1	.01
M. foedus fluviatilis Brun.	--	--	.05	.07	--	2.00	--	.32	9	.09
M. foedus foedus Scudd.	.88	.84	.05	.07	--	--	.21	--	44	.43
M. foedus iselyi Hebard	--	--	--	--	--	--	.21	--	1	.01
M. keeleri luridus	--	.04	--	--	--	--	--	--	1	.01

Species	Percentage collected in--								Total specimens	Percentage of grand total
	Small grain	Pasture	Legumes	Sorghums	Corn	Weeds	Road side	Coulee bottom		
Melanoplus lakinus	2.81	.80	.63	2.13	.34	4.33	.84	.32	151	1.46
M. mexicanus	40.51	28.96	31.73	17.73	15.30	23.67	7.38	4.42	2856	27.62
M. occidentalis	--	--	--	--	--	.33	--	--	1	.01
M. packardii	6.08	5.36	3.31	2.55	4.68	7.00	5.06	1.89	473	4.57
M. regalis	.08	2.24	.09	.07	--	--	.21	--	59	.57
Mermiria maculipennis	.34	2.45	.27	.43	.23	--	.21	.63	83	.80
Mermiria neomexicana (Thos.)	--	.25	--	--	--	--	.42	--	8	.08
Metator pardalinus	--	.04	--	--	--	--	--	--	1	.01
Opeia obscura	--	1.39	--	---	--	--	--	--	33	.32
Orphulella pelidna	--	.08	.05	.07	--	--	--	--	4	.04
Orphulella speciosa	.13	2.15	.23	--	.11	--	.21	--	61	.59
Pardalophora haldemanii	--	.89	.05	--	.11	--	--	--	23	.22
Phlibostroma quadrimaculatum	--	5.32	.05	--	--	--	--	.32	128	1.24
Phoetaliotes nebrascensis	.17	.38	--	--	.11	--	--	--	14	.14
Schistocera a. americana	.13	.04	.05	--	.11	--	--	--	6	.06
Schistocerca lineata	.08	--	--	---	--	--	--	--	2	.02
Spharagemon collare	.80	--	.05	.14	--	--	--	--	22	.21
Spharagemon equale	.04	---	--	.28	.11	.33	--	--	7	.07
Syrbula admirabilis	--	.13	.27	--	.23	--	--	--	11	.11
Trachyrhachis kiowa fuscifrons	--	.38	--	--	.11	--	--	--	10	.10
Trachyrhachis kiowa kiowa	--	.17	--	--	--	--	--	--	4	.04
Trimerotropis laticincta	.08	.04	--	--	.11	1.33	--	--	8	.08
Nymphs	15.64	14.86	27.83	10.71	10.62	4.67	14.77	8.52	1694	16.38
Total specimens per environment--	2,384	2,368	2,206	1,410	876	300	474	317	10,335	--

KANSAS

The percentages of individuals of the various species present in Kansas, arranged according to crops infested, are summarized as follows:

Small grain	Percent	Pasture	Percent
1. Melanoplus mexicanus	41	1. Melanoplus mexicanus	29
2. M. bivittatus	10	2. Ageneotettix deorum	10
3. Aeoloplus t. bruneri	9	3. M. packardii	5
4. M. differentialis	8	4. Phlibostroma quadrimaculatum	5
5. M. packardii	6	5. Aulocara elliotti	5
6. 22 other species	26	6. 35 other species	46
Nymphs - 16		Nymphs - 15	

Legumes		Sorghums	
1. Melanoplus mexicanus	32	1. Melanoplus differentialis	32
2. M. differentialis	16	2. M. bivittatus	24
3. M. bivittatus	16	3. M. mexicanus	18
4. M. packardii	3	4. Aeoloplus t. bruneri	6
5. Aeoloplus t. bruneri	1	5. M. packardii	3
6. 23 other species	32	6. 18 other species	17
Nymphs - 28		Nymphs - 11	

Corn		Weeds	
1. Melanoplus differentialis	39	1. Aeoloplus t. bruneri	42
2. M. bivittatus	21	2. Melanoplus mexicanus	24
3. M. mexicanus	15	3. M. differentialis	7
4. M. packardii	5	4. M. packardii	7
5. Ageneotettix deorum	2	5. M. bivittatus	3
6. 18 other species	18	6. 12 other species	17
Nymphs - 11		Nymphs - 5	

Roadside		Coulee bottom	
1. Melanoplus differentialis	33	1. Hesperotettix speciosus	43
2. M. bivittatus	16	2. Melanoplus differentialis	21
3. Aeoloplus t. bruneri	12	3. M. bivittatus	16
4. M. mexicanus	7	4. M. mexicanus	4
5. M. packardii	5	5. M. packardii	2
6. 18 other species	27	6. 9 other species	14
Nymphs - 15		Nymphs - 9	

Percentage of grand total

1. Melanoplus mexicanus 28
2. M. differentialis 16
3. M. bivittatus 13
4. Aeoloplus t. bruneri 6
5. M. packardii 5
6. 47 other species 32

Nymphs - 16

MICHIGAN

Collections have been made in Michigan during the years 1935 to 1938, inclusive. This past season 4,608 specimens were collected in 5 environments. There were 18 species represented in these collections, with immature forms making up only 3.43 percent. In all 5 environments, M. mexicanus was by far the most numerous and formed 68 percent of the total number of specimens collected. Cannula pellucida is second in relative abundance, and Ageneotettix deorum third. There is about the same relative difference in numbers between M. mexicanus and C. pellucida in 1938 as there was in 1937, but Ageneotettix deorum has definitely increased its relative abundance. It supplanted M. femur-rubrum for third place.

Hatching of M. mexicanus began the latter part of April and dragged out through May and June. Heavy rains reduced nymphal populations, delayed and prolonged hatching, and interfered with the baiting. Most of the baiting was done in July when the hoppers were most active. The grasshopper potential in the 1938 survey was found to be about 85 percent of what it was in the 1937 survey. Although M. mexicanus was by far the most numerous and important grasshopper, yet it does not develop the migratorial tendencies in Michigan that it does in the Great Plains States. Infestations in Michigan are of local character and importance, perhaps because of the natural vegetation and agricultural practices found in Michigan. Numerous small pastures, with plenty of vegetation, and small farms interspersed among heavily wooded areas do not encourage much moving about, as do the broad, wide, open, sparsely vegetated lands of the Great Plains.

Distribution by species of 4,608 specimens collected in Michigan, expressed in percentage of total number collected in each habitat

Species	Percentage collected in--					Total specimens	Percentage of grand total
	Pasture	Legumes	Small grain	Truck crops	Roadside		
Ageneotettix d. deorum	7.47	5.13	14.41	4.24	--	321	6.97
Arphia pseudonietana	1.89	.24	.85	--	0.88	69	1.50
Camnula pellucida	16.39	12.35	4.24	10.17	45.13	733	15.91
Chloealtis conspersa	.03	--	--	--	--	1	.02
Chortippus longicornis	.23	.24	--	--	--	10	.22
Dissosteira carolina	03	.12	.85	.85	--	4	.09
Encoptolophus sordidus sordidus	.17	--	--	--	--	6	.13
Hesperotettix viridis	.03	--	--	--	--	1	.02
Melanoplus angustipennis	.46	--	.85	--	--	17	.37
M. bivittatus	.15	.24	.85	--	--	8	.17
M. confusus	.06	.12	--	--	--	3	.07
M. dawsoni	.09	.12	--	--	--	4	.09
M. femur-rubrum	.41	1.34	1.69	--	.88	28	.61
M. f. flavidus	.15	.24	.85	--	--	8	.17
M. mexicanus	66.34	72.37	73.73	79.66	52.21	3115	67.60
Orphulella speciosa	1.31	.12	--	--	--	46	1.00
Scirtetica m. marmorata Harr.	.06	--	--	--	--	2	.04
Spharagemon collare	1.51	2.08	--	4.24	--	74	1.61
Nymphs	3.23	5.26	1.69	.85	.88	158	3.43
Total specimens per environment	3,441	818	118	118	113	4,608	--

MICHIGAN

The percentages of individuals of the various species present in Michigan, arranged according to crops infested, are summarized as follows:

Pasture

		Percent
1.	Melanoplus mexicanus	66
2.	Camnula pellucida	16
3.	Ageneotettix d. deorum	7
4.	Arphia pseudonietana	2
5.	Spharagemon collare	2
6.	13 other species	7

Nymphs - 3

Legumes

		Percent
1.	Melanoplus mexicanus	72
2.	Camnula pellucida	12
3.	Ageneotettix d. deorum	5
4.	Spharagemon collare	2
5.	M. femur-rubrum	1
6.	8 other species	8

Nymphs - 5

Small grain

1.	Melanoplus mexicanus	74
2.	Ageneotettix d. deorum	14
3.	Camnula pellucida	4
4.	M. femur-rubrum	2
5.	Arphia pseudonietana	1
6.	4 other species	5

Nymphs - 2

Truck crops

1.	Melanoplus mexicanus	80
2.	Camnula pellucida	10
3.	Ageneotettix d. deorum	4
4.	Spharagemon collare	4
5.	Dissosteira carolina	1
6.	Nymphs	1

Roadside

1.	Melanoplus mexicanus	52
2.	Camnula pellucida	45
3.	Arphia pseudonietana	1
4.	M. femur-rubrum	1
5.	Nymphs	1

Percentage of grand total

1.	Melanoplus mexicanus	68
2.	Camnula pellucida	16
3.	Ageneotettix deorum	7
4.	Spharagemon collare	2
5.	Arphia pseudonietana	2
6.	13 other species	5

MINNESOTA

This is the fourth year that collections have been made in Minnesota. They were made in 1935, 1936, 1937, and 1938. During the past season, 14,402 specimens were taken in 8 major environments. Of these 25.3 percent were immature forms of undetermined species. In the collections the dominant species was M. femur-rubrum in all of the habitats except flax, where M. mexicanus was most numerous. M. mexicanus is second in numbers and Ageneotettix deorum is third. This, however, does not speak the truth for the situation for the western part of the State and the Red River Valley, into which enormous numbers of M. mexicanus migrated in July and August. Camnula pellucida and M. bivittatus were the two most important species in the State from 1932 to 1936, inclusive. Beginning about 1935, M. femur-rubrum has steadily increased in relative numbers and importance. M. mexicanus began in 1936 to increase its importance. Another outstanding fact was the increase in M. differentialis in the southwestern counties. No specimens of this species are recorded in the 1935, 1936, and 1937 collections. In 1938, there were 239 specimens taken, which is 1.66 percent of the total of 14,402 specimens of all species collected in the State. It ranks third in corn and potatoes reaching its greatest relative importance in corn at 11 percent and is sixth in the total numbers collected.

Hatching began the second week in May and continued rains delayed and prolonged it throughout May and June. Nymphs of M. femur-rubrum were still numerous in September. Heavy baiting was done throughout July and August against the migrating swarms of M. mexicanus into the Red River Valley areas. Owing to these migrations, the grasshopper potential as found in the 1938 survey is over one and one-half times that of 1937.

Distribution by species of 14,402 specimens collected in Minnesota, expressed in percentage of total number collected in each habitat

Species	Percentage collected in--								Total specimens	Percentage of grand total
	Legumes	Small grain	Pasture	Idle low land	Roadside	Flax	Corn	Potatoes		
Aeropedellus clavatus	--	--	0.04	--	--	--	--	--	2	0.01
Ageneotettix deorum	0.32	1.29	6.33	7.63	5.42	--	--	--	500	3.47
Arphia pseudonietana	.04	.11	1.48	.22	--	--	--	--	89	.62
Arphia sulphurea	.02	--	--	--	--	0.35	--	--	2	.01
Camnula pellucida	1.01	.32	5.55	--	--	--	--	--	370	2.57
Chloealtis conspersa	--	--	.02	--	--	--	--	--	1	.01
Chortippus longicornis	.38	--	3.21	.95	--	--	--	--	214	1.49
Dissosteira carolina	.11	.65	.05	--	.49	--	--	--	16	.11
Encoptolophus sordidus sordidus	.50	--	.20	--	--	--	0.63	--	40	.28
Hesperotettix viridis	--	--	.07	.73	--	--	--	--	14	.10
Melanoplus angustipennis	--	1.08	.96	3.01	--	.35	--	0.66	108	.75
M. bivittatus	1.84	1.08	.62	1.39	7.88	7.99	10.06	2.30	228	1.58
M. dawsoni	2.27	.11	3.66	--	--	3.82	1.89	.33	347	2.41
M. differentialis	1.21	.97	1.18	3.52	1.97	3.47	10.69	5.92	239	1.66
M. femur-rubrum	53.92	73.09	35.32	46.90	19.21	26.04	34.59	60.85	6646	46.12
M. flavidus flavidus	--	.65	1.11	1.47	--	--	--	--	88	.61
M. gladstoni	.11	.11	.84	.44	--	--	.63	--	61	.42
M. infantilis	.02	--	1.93	--	--	--	--	--	109	.76
M. keeleri luridus	.32	.32	.53	--	--	--	--	--	51	.35
M. mexicanus	7.33	11.86	6.67	1.76	14.29	46.52	13.84	27.63	1184	8.22
M. packardii	--	.32	--	--	--	--	.63	.66	6	.04
Opeia obscura	--	--	.02	--	--	--	--	--	1	.01
Orphulella pelidna	.02	--	.36	.15	--	--	--	--	23	.16
Orphulella speciosa	.09	.11	1.39	.37	--	--	--	--	89	.62
Phoetaliotes nebrascensis	.16	.75	1.14	1.10	--	--	2.52	--	99	.69
Pseudopomala brachyptera Scudd.	--	--	.02	--	--	--	--	--	1	.01
Psinidia fenestralis Serv.	--	--	.02	.37	--	--	--	--	6	.04
Schistocerca sp.	.04	.32	.14	.66	--	--	4.40	--	29	.20
Spharagemon collare	.36	.86	1.09	1.39	.49	--	1.26	--	111	.77
S. equale	--	--	.02	--	--	--	--	--	1	.01
Trachyrhachis kiowa	.31	.11	.87	.95	.99	--	--	--	82	.57
Nymphs	29.63	5.82	25.16	26.94	49.26	11.46	18.87	1.64	3645	25.30
Total specimens per environment	5,552	927	5,607	1,362	203	288	159	304	14,402	--

MINNESOTA

The percentages of individuals of the various species present in Minnesota, arranged according to crops infested, are summarized as follows:

Legumes

		Percent
1.	Melanoplus femur-rubrum------	54
2.	M. mexicanus----------	7
3.	M. dawsoni----------	2
4.	M. bivittatus----------	2
5.	M. differentialis----------	1
6.	16 other species----------	34
	Nymphs - 30	

Small grain

		Percent
1.	Melanoplus femur-rubrum-------	73
2.	M. mexicanus----------	12
3.	Ageneotettix deorum----------	1
4.	M. angustipennis----------	1
5.	M. bivittatus----------	1
6.	14 other species----------	12
	Nymphs - 6	

Pasture

1.	Melanoplus femur-rubrum------	35
2.	M. mexicanus----------	7
3.	Ageneotettix deorum----------	6
4.	Camnula pellucida----------	6
5.	M. dawsoni----------	4
6.	24 other species----------	42
	Nymphs - 25	

Idle low land

1.	Melanoplus femur-rubrum-------	47
2.	Ageneotettix deorum----------	8
3.	M. differentialis ----------	4
4.	M. angustipennis----------	3
5.	M. mexicanus----------	2
6.	13 other species----------	36
	Nymphs - 27	

Roadside

1.	Melanoplus femur-rubrum------	19
2.	M. mexicanus----------	14
3.	M. bivittatus----------	8
4.	Ageneotettix deorum----------	5
5.	M. differentialis----------	2
6.	3 other species----------	52
	Nymphs - 49	

Flax

1.	Melanoplus mexicanus----------	47
2.	M. femur-rubrum----------	26
3.	M. bivittatus----------	8
4.	M. dawsoni----------	4
5.	M. differentialis ----------	3
6.	2 other species----------	12
	Nymphs - 11	

Corn

1.	Melanoplus femur-rubrum------	35
2.	M. mexicanus----------	14
3.	M. differentialis----------	11
4.	M. bivittatus----------	10
5.	Schistocerca sp----------	4
6.	6 other species----------	26
	Nymphs - 19	

Potatoes

1.	Melanoplus femur-rubrum-------	61
2.	M. mexicanus----------	28
3.	M. differentialis----------	6
4.	M. bivittatus----------	2
5.	M. angustipennis----------	1
6.	2 other species----------	2
	Nymphs - 2	

Percentage of grand total

1.	Melanoplus femur-rubrum-----	46
2.	M. mexicanus----------	8
3.	Ageneotettix deorum---------	3
4.	Camnula pellucida----------	3
5.	M. dawsoni----------	2
6.	26 other species----------	38
	Nymphs - 25	

MISSOURI

This is the first year in which Missouri has been included in the project for making collections in typical environments during the adult survey; and, since this is a first time for this State, something should be said regarding its natural vegetation areas. The State is divided into two major natural vegetation areas. The northern half and western portions are tall-grass prairie or bluestem sod (Andropogon), whereas in the southern half and eastern areas and along streams are the southern hardwoods, "oak and hickory" and "oak and pine." About 38 percent of the land area is in cultivated crops. The crop land is intensively cultivated, with most of the grasshopper breeding grounds limited to field margins, alfalfa fields, and small pastures.

There were 8,198 specimens collected in 7 major environments. Of this number, the two dominant species were Melanoplus differentialis and M. mexicanus, forming 20 and 21 percent, respectively, of the total number. M. differentialis by far was the most important species in corn, soybeans, and weedy places. M. mexicanus was dominant in pastures, tame-hay meadows, alfalfa, and small grain. Of the total collection 36 percent were nymphs of undetermined species. There were 28 species collected and determined.

Deposition of eggs was heavy in the two dominant species in the fall of 1937 but no dense nymphal populations resulted in 1938. Heavy rains, prolonged hatching, increased fungous disease, and other causes held them down. Nymphs of M. femur-rubrum were numerous in July, especially in the eastern portions. This accounts in part for the high percentage of nymphs in the collections. By the first week in May about 50 percent of the M. mexicanus and M. bivittatus had hatched, whereas M. differentialis did not begin hatching until about the middle of May. Oviposition for the two former species began about the middle of July, whereas M. differentialis began a month or so later. The grasshopper potential is down from one-third to one-half of the potential in the 1937 fall survey.

Distribution by species of 8,198 specimens collected in Missouri, expressed in percentage of total number collected in each habitat

Species	Percentage collected in--							Total specimens	Percentage of grand total
	Pasture	Tame-hay meadow	Legumes	Small grain	Corn	Soybeans	Weeds		
Ageneotettix deorum	4.71	1.87	0.86	1.47	0.13	--	--	187	2.28
Arphia simplex	.04	--	--	.09	--	--	--	2	.02
Arphia sulphurea	.04	--	--	--	--	--	--	1	.01
Arphia xanthoptera	.04	.06	--	.09	--	--	--	3	.04
Chortophaga viridifasciata	1.48	1.68	2.76	4.06	.13	--	.75	157	1.91
Dichromorpha viridis	.07	--	.07	--	.13	--	--	4	.05
Dissosteira carolina	.07	.06	.20	.09	.13	.79	--	11	.13
Encoptolophus sordidus sordidus	.19	.13	--	--	--	--	.75	8	.10
Hadrotettix trifasciatus	.15	.06	.07	--	.13	.26	--	8	.10
Hesperotettix speciosus	.07	--	--	.09	--	--	--	3	.04
Hesperotettix viridis	--	--	.07	--	--	--	--	1	.01
Hippiscus rugosus	2.04	.71	.72	.69	.13	--	1.50	88	1.07
Melanoplus bivittatus	3.60	5.36	7.10	5.79	6.42	5.53	2.26	428	5.22
M. confusus	--	--	.07	--	--	--	--	1	.01
M. differentialis	12.13	7.42	15.98	11.14	72.48	62.10	53.38	1674	20.41
M. femur-rubrum	5.68	5.36	4.01	1.12	1.18	1.05	1.50	325	3.96
M. mexicanus	13.50	26.47	21.71	44.12	2.23	13.68	13.53	1702	20.75
M. packardii	.04	--	.13	.17	.13	--	--	6	.07
M. s. scudderi	--	--	.20	--	--	--	--	3	.04
Orphulella sp.	10.61	4.32	3.16	.78	--	--	3.01	414	5.05
O. pelidna	2.93	--	--	--	--	--	--	79	.96
Pardalophora haldemanii	.11	.13	--	.09	--	--	--	6	.07
P. phoenicoptera Burm.	--	--	--	.09	--	--	--	1	.01
Schistocerca alutacea	--	--	.07	--	--	--	.75	2	.02
S. a. americana	.19	--	.72	.26	.26	1.58	1.50	29	.35
S. lineata	--	.06	.07	--	--	--	--	2	.02
Syrbula admirabilis	.48	.26	.39	.35	.13	--	.75	29	.35
Trachyrhachis kiowa fuscifrons	1.74	1.16	.20	.17	--	--	--	70	.85
Undetermined	--	--	.07	.09	.26	.26	--	5	.06
Nymphs	40.07	44.86	41.38	29.27	16.12	14.74	20.30	2949	35.95
Total specimens per environment	2,695	1,549	1,520	1,158	763	380	133	8,198	--

MISSOURI

The percentages of individuals of the various species present in Missouri, arranged according to crops infested, are summarized as follows:

	Pasture	Percent
1.	Melanoplus mexicanus	14
2.	M. differentialis	12
3.	Orphulella sp.	11
4.	M. femur-rubrum	6
5.	Ageneotettix deorum	5
6.	17 other species	52
	Nymphs - 40	

	Tame hay meadow	Percent
1.	Melanoplus mexicanus	26
2.	M. differentialis	7
3.	M. bivittatus	5
4.	M. femur-rubrum	5
5.	Orphulella sp.	4
6.	11 other species	53
	Nymphs - 45	

	Legumes	
1.	Melanoplus mexicanus	22
2.	M. differentialis	16
3.	M. bivittatus	7
4.	M. femur-rubrum	4
5.	Orphulella sp.	3
6.	16 other species	48
	Nymphs - 41	

	Small grain	
1.	Melanoplus mexicanus	44
2.	M. differentialis	11
3.	M. bivittatus	6
4.	Chortophaga viridifasciata	4
5.	Ageneotettix deorum	1
6.	14 other species	34
	Nymphs - 29	

	Corn	
1.	Melanoplus differentialis	72
2.	M. bivittatus	6
3.	M. mexicanus	2
4.	M. femur-rubrum	1
5.	10 other species	19
	Nymphs - 16	

	Soybeans	
1.	Melanoplus differentialis	62
2.	M. mexicanus	14
3.	M. bivittatus	6
4.	Schistocerca a. americana	2
5.	M. femur-rubrum	1
6.	3 other species	15
	Nymphs - 15	

	Weeds	
1.	Melanoplus differentialis	53
2.	M. mexicanus	14
3.	Orphulella sp.	3
4.	M. bivittatus	2
5.	M. femur-rubrum	2
6.	6 other species	26
	Nymphs - 20	

	Percentage of grand total	
1.	Melanoplus mexicanus	21
2.	M. differentialis	20
3.	M. bivittatus	5
4.	Orphulella sp.	5
5.	M. femur-rubrum	4
6.	23 other species	45
	Nymphs - 36	

MONTANA

This is the fifth year in which collections were made in typical environments in Montana during the adult survey. There were 11,129 specimens, representing 45 different species, collected in 9 environments. Because of the great flights in July 1938, of Melanoplus mexicanus into eastern Montana, this species was by far the most numerous of all. The year 1938 can be considered as the year of its greatest majority in all environments during the 5 years of collections. It formed 63 percent of the total specimens taken in the State, 46 percent in alfalfa, 83 percent in idle land, 66 percent in reverted land, 85 percent in sugar beets, 82 percent in small grain, 54 percent in range land, and 94 percent in corn, where it is not often a pest. M. femur-rubrum, M. bivittatus, and M. packardii were the other important species. Cannula pellucida and Aulocara elliotti were of still lesser importance. The most interesting species has been M. mexicanus, because of its spectacular flights and the interest shown in its infestations in range and idle land. In the recent history the open range land has not harbored serious outbreaks of this species. The drought of 1934 drove M. mexicanus to the open range and it was the dominant species that year in the collections from these places. In the extreme eastern part of the State, it made up 45 percent of the grasshoppers found in the range. This seemed to have had little effect on the grasshopper fauna the following year, 1935, for M. mexicanus occupied fifth place in the range-land collections, forming 9 percent of such collections. In both the 1936 and 1937 collections it was third in number at 10 percent. Owing to the flights in 1938, it was in first place again, at 54 percent of the total specimens collected on the range land. In 1934 M. bivittatus was greatly reduced by the drought throughout the State. It has increased in numbers proportionately, until in 1938 it held third place, along with M. packardii. On the range land, M. infantilis seems to have equaled or outnumbered Aulocara elliotti and Agencotettix deorum which were the dominant species in 1937.

Hatching of M. mexicanus began the first week of May and, because of rainy weather, was retarded and prolonged throughout June. The fall survey of 1937 indicated a general reduction in the grasshopper potential in the eastern half of the State. The nymphal surveys showed light populations of nymphs of from 0 to 5 per square yard in many open fields, with heavier populations of from 20 to 150 concentrated along field margins and even 1,000 per square yard in 1 place. These figures did not begin to approach the enormous numbers occurring in north-central South Dakota and parts of North Dakota. Beginning on July 1 and continuing throughout the period of the major flights into eastern Montana from North and South Dakota, population counts ran from 20 to 200 per square yard in many places. Heavy egg deposition occurred where these flights terminated. As in eastern Wyoming, a steadily decreasing grasshopper potential from 1934 has been changed in 1 season to an infestation of major importance.

Distribution by species of 11,129 specimens collected in Montana, expressed in percentage of total number collected in each habitat

Species	Percentage collected in--									Total specimens	Percentage of grand total
	Legumes	Small grain	Idle land	Plains grassland	Reversion	Low Mtn. grassland	Weedy roadside	Corn	Sugar beets		
Aeoloplus turnbullii turnbullii----	0.28	2.66	1.60	0.58	3.25	1.10	1.44	0.34	--	138	1.24
Aerochoreutes c. carlinianus Thos.-	--	.04	--	.06	--	--	--	--	--	2	.02
Aeropedellus clavatus----------	--	--	.06	.19	--	--	--	--	--	4	.04
Ageneotettix deorum----------	.26	.34	.44	6.27	1.63	--	3.09	--	--	146	1.31
Amphitornus coloradus----------	.13	.04	.17	1.55	.41	--	.21	--	--	36	.32
Arphia pseudonietana----------	--	.04	.06	.26	--	--	--	--	--	6	.05
Aulocara elliotti----------	.78	1.14	2.49	6.34	2.64	--	2.68	--	--	226	2.03
Boopedon nubilum----------	--	--	--	--	.20	--	--	--	--	1	.01
Bruneria brunnea Thos.----------	--	--	.06	.06	--	--	--	--	--	2	.02
Camnula pellucida----------	3.18	1.10	.33	1.55	2.03	15.47	1.65	.34	.81	226	2.03
Chortippus longicornis----------	.50	.25	---	---	---	2.21	---	---	---	29	.26
Cordillacris crenulata----------	---	---	---	.32	---	--	--	--	--	5	.04
C. occipitalis occipitalis----------	--	--	--	.06	--	--	--	--	--	1	.01
Cratypedes neglectus Thos.----------	--	.17	--	--	--	--	--	--	--	4	.04
Derotmema haydenii----------	.05	.38	.61	.71	--	--	.62	--	--	36	.32
Dissosteira carolina----------	.26	.17	.72	--	.20	.55	1.86	2.75	--	46	.41
Drepanopterna femoratum----------	.03	--	--	.91	--	--	.21	--	--	16	.14
Encoptolophus sordidus costalis----	.05	--	.33	.19	.20	--	--	--	--	12	.11
E. s. sordidus----------	--	--	--	.06	--	--	--	--	--	1	.01
Hadrotettix trifasciatus----------	.03	.21	.22	.39	.20	--	.21	--	--	18	.16
Hesperotettix viridis----------	--	--	.06	.26	.20	.55	.41	--	--	9	.08
Melanoplus angustipennis----------	.23	.42	.66	--	--	--	--	.34	--	32	.29
M. bivittatus----------	10.45	1.48	1.33	.78	3.66	5.52	7.83	1.03	12.20	561	5.04
M. bowditchi canus Hebard----------	--	--	--	.13	--	--	--	--	--	2	.02
M. confusus----------	.03	--	--	--	--	--	--	--	--	1	.01
M. dawsoni----------	.18	--	--	.97	--	1.66	.41	--	--	27	.24
M. differentialis----------	.78	--	.06	--	--	--	--	--	--	31	.28
M. femur-rubrum----------	14.96	1.27	1.49	1.42	3.25	14.92	5.15	--	2.44	724	6.50
M. foedus foedus----------	--	--	--	--	.61	--	1.65	--	--	11	.10
M. gladstoni----------	.42	--	.50	.84	1.22	--	--	--	--	44	.40
M. infantilis----------	.10	.25	.33	6.79	--	--	--	--	--	121	1.09

Montana (Continued)

Species	Percentage collected in--									Total specimens	Percentage of grand total
	Legumes	Small grain	Idle land	Plains grassland	Reversion	Low mtn. grassland	Weedy roadside	Corn	Sugar beets		
Melanoplus mexicanus	45.47	82.11	83.02	54.01	66.26	12.71	62.27	93.81	84.55	7053	63.34
M. occidentalis	.08	.04	.17	.58	--	--	.21	--	--	17	.15
M. packardii	5.97	3.55	3.10	4.59	4.47	8.29	6.80	1.37	--	514	4.62
Mermeria maculipennis macclungi-	.03	--	--	--	--	--	--	--	--	1	.01
Metator pardalinus	.08	.08	.11	2.13	.41	--	--	--	--	42	.38
Opeia obscura	.08	.04	--	--	.61	--	--	--	--	7	.06
Orphulella pelidna	--	--	.06	--	--	--	--	--	--	1	.01
Phlibostroma quadrimaculatum	--	--	.06	2.20	.20	--	--	--	--	36	.32
Phoetaliotes nebrascensis	.03	--	.06	.32	--	--	.21	--	--	8	.07
Spharagemon collare	.03	.25	.44	.06	--	--	.62	--	--	19	.17
S. equale	.05	.21	.55	.39	.81	--	.41	--	--	29	.26
Trachyrhachis k. kiowa	.23	.13	.17	1.29	1.02	--	--	--	--	40	.36
Trimerotropis laticincta	.05	.13	.33	.13	--	--	.62	--	--	16	.14
T. palidipennis	.03	--	.06	.26	--	--	--	--	--	6	.05
Nymphs	15.02	3.46	.39	3.30	6.50	37.02	1.44	--	--	822	7.38
Total specimens per environment	3,835	2,367	1,809	1,546	492	181	485	291	123	11,129	--

MONTANA

The percentages of individuals of the various species present in Montana, arranged according to crops infested, are summarized as follows:

Legumes	Percent
1. Melanoplus mexicanus	46
2. M. femur-rubrum	15
3. M. bivittatus	11
4. M. packardii	6
5. Camnula pellucida	3
6. 26 other species	19
Nymphs - 15	

Small grain	Percent
1. Melanoplus mexicanus	82
2. M. packardii	4
3. Aeoloplus t. turnbullii	3
4. M. bivittatus	1
5. M. femur-rubrum	1
6. 20 other species	9
Nymphs - 3	

Idle land	
1. Melanoplus mexicanus	83
2. M. packardii	3
3. Aulocara elliotti	3
4. Aeoloplus t. turnbullii	2
5. M. femur-rubrum	1
6. 26 other species	8
Nymphs - 0	

Plains grassland	
1. Melanoplus mexicanus	54
2. M. infantilis	7
3. Aulocara elliotti	6
4. Ageneotettix deorum	6
5. M. packardii	5
6. 29 other species	22
Nymphs - 3	

Reversion	
1. Melanoplus mexicanus	66
2. M. packardii	4
3. M. bivittatus	4
4. M. femur-rubrum	3
5. Aeoloplus t. turnbullii	3
6. 16 other species	20
Nymphs - 7	

Low-mountain grassland	
1. Camnula pellucida	15
2. M. femur-rubrum	15
3. M. mexicanus	13
4. M. packardii	8
5. M. bivittatus	6
6. 5 other species	43
Nymphs - 37	

Weedy roadside	
1. Melanoplus mexicanus	62
2. M. bivittatus	8
3. M. packardii	7
4. M. femur-rubrum	5
5. Ageneotettix deorum	3
6. 16 other species	15
Nymphs - 1	

Corn	
1. Melanoplus mexicanus	94
2. Dissosteira carolina	3
3. Melanoplus packardii	1
4. M. bivittatus	1
5. 3 other species	1
Nymphs - 0	

Sugar beets	
1. Melanoplus mexicanus	85
2. M. bivittatus	12
3. M. femur-rubrum	2
4. Camnula pellucida	1
Nymphs - 0	

Percentage of grand total	
1. Melanoplus mexicanus	63
2. M. femur-rubrum	7
3. M. bivittatus	5
4. M. packardii	5
5. Camnula pellucida	2
6. 40 other species	18
Nymphs - 7.	

NEBRASKA

This is the third adult collection made in Nebraska during the regular adult survey. The other two were made in 1935 and 1937, respectively. No collection was made in 1936. There were 12,965 specimens collected in 6 environments and miscellaneous crops not treated separately, with about 56 species represented. Immature forms comprised about 16 percent of the total specimens collected. Melanoplus mexicanus was easily the dominant grasshopper in all environments, with M. differentialis and M. bivittatus, of equal numbers, second in importance. This held true in alfalfa, small grain, and idle land. In corn M. differentialis was about equal with M. mexicanus in numbers collected. M. bivittatus was third in corn. In 1937 the genus Cordillacris was the most numerous on range and idle land, ranking second to M. mexicanus in the number collected. It formed 8 percent of the total number of specimens collected, while M. mexicanus formed 12 percent. In the 1938 collections Cordillacris formed only half of 1 percent of the total specimens collected and did not come in the first 5 important species classification in any of the environments. A similar sharp reduction of this genus took place in Montana between 1935 and 1936. In 1935 C. crenulata was the most abundant species on the range, forming 15 percent of all specimens collected in this environment. In 1936 it dropped to eighth place forming only 3 percent of those collected. There was definite increase in the relative numbers of M. bivittatus and M. differentialis over the 1937 collections. This increase is as follows: In 1937 M. bivittatus formed 4.16 percent of the total specimens collected and in 1938, 10.57 percent; M. differentialis formed 4.82 percent in 1937 and 11.32 percent in 1938. Egg surveys show these two species on the increase. M. mexicanus also increased from 12.15 percent in 1937 to 31.59 percent in 1938.

Hatching began the latter part of April for M. mexicanus and small local flights of this species began after June 15 and continued through July. There were no major flights like those in the Dakotas, because there was not the pressure of enormous populations. Some second generation of this species hatched out around the first of August, but not nearly so many as in 1937. This was evidenced by a lessened need for control to protect fall grain. Small local flights of M. bivittatus also occurred in July. There were sharp reductions in nymphal populations in parts of eastern Nebraska, because of continuous rains. Predicted infestations did not materialize. On the basis of estimated bait needs, the problem for 1939 will be about the same as it was in 1938.

Distribution by species of 12,965 specimens collected in Nebraska, expressed in percentage of total number collected in each habitat

Species	Percentage collected in--							Total specimens	Percentage of grand total
	Alfalfa	Plains grass land	Roadside	Small grain	Corn	Idle land	Misc. crops[1]		
Aeoloplus turnbullii bruneri	3.32	0.61	4.86	2.10	1.24	--	3.77	313	2.41
A. turnbullii turnbullii	--	.04	--	--	--	--	--	1	.01
Ageneotettix deorum	2.53	17.61	1.08	3.44	.86	3.94	3.77	700	5.40
Amphitornus coloradus	--	1.63	--	.05	--	--	.42	43	.33
Arphia pseudonietana	--	.04	--	--	--	--	--	1	.01
A. xanthoptera	--	--	--	--	.10	--	--	1	.01
Aulocara elliotti	1.06	4.84	.54	6.63	.38	.15	.84	327	2.52
Boopedon nubilum	--	--	--	.05	--	--	--	1	.01
Boopedon sp.	--	.04	--	--	--	--	--	1	.01
Campylocantha o. olivacea	--	--	.09	--	--	1.17	--	9	.07
Cordillacris crenulata	--	.41	--	--	--	--	--	10	.08
C. o. occipitalis	.12	1.61	.36	.14	--	--	.21	56	.43
Dactylotum pictum	.02	--	--	--	--	--	--	1	.01
Derotmema haydenii	.10	--	.27	.19	.19	--	--	14	.11
Dissosteira carolina	.04	.16	.09	1.19	.48	--	.84	41	.32
D. longipennis	--	--	--	.10	--	--	--	2	.02
Drepanopterna femoratum	--	.69	--	.05	--	--	--	18	.14
Encoptolophus sordidus costalis	--	.12	--	--	--	--	--	3	.02
E. subgracilis texensis Burm.	--	--	--	--	.10	--	--	1	.01
Hadrotettix trifasciatus	.08	.33	.09	.29	.10	.29	--	22	.17
Hesperotettix speciosus	.08	.57	1.08	.81	--	5.69	--	86	.66
H. viridis	.02	1.02	.81	--	--	--	--	35	.27
Hippiscus rugosus	--	.12	--	--	--	--	.42	5	.04
Hypochlora alba	--	.24	--	--	--	--	--	6	.05
Melanoplus angustipennis	2.26	2.89	3.87	.57	1.00	2.77	.84	274	2.11
M. bivittatus	12.92	3.25	12.88	7.35	19.29	8.02	16.56	1371	10.57
M. bowditchi	.10	1.38	4.86	.05	.57	3.06	.21	122	.94
M. confusus	.02	.04	--	--	--	--	--	2	.02
M. differentialis	11.99	1.30	18.74	8.11	30.09	13.12	9.01	1469	11.32
M. femur-rubrum	6.65	2.24	2.07	1.53	1.43	6.71	18.45	598	4.61
M. flavidus	--	--	--	--	--	.58	--	4	.03
M. foedus fluviatilis	.02	--	.09	--	--	--	--	2	.02

Species	Percentage collected in--							Total specimens	Percentage of grand total
	Alfalfa	Plains grass land	Roadside	Small grain	Corn	Idle land	Misc. crops 1/		
Melanoplus foedus foedus	0.49	3.30	4.86	1.29	0.67	3.35	2.73	230	1.77
M. gladstoni	.02	.12	--	--	--	--	--	4	.03
M. infantilis	.06	.08	--	.14	--	--	--	8	.06
M. lakinus	.47	.08	.27	.24	.19	--	.42	38	.29
M. mexicanus	28.38	29.09	28.92	46.39	31.33	28.72	24.74	4097	31.59
M. occidentalis	.04	.77	.18	--	--	.15	--	24	.19
M. packardii	1.92	2.32	2.79	1.72	3.34	4.52	1.68	296	2.28
M. regalis	--	.12	--	--	--	--	--	3	.02
Mermiria maculipennis	.20	5.21	1.35	2.10	.88	1.17	2.31	225	1.73
Mermiria neomexicana	--	.16	--	--	--	--	--	4	.03
Metator pardalinus	.02	.45	--	--	--	--	--	12	.09
Nestobregma p. plattei Thos.	--	.08	--	--	--	--	--	2	.02
Opeia obscura	--	.65	--	--	--	--	--	16	.12
Orphulella pelidna	--	.69	.36	.24	--	--	--	26	.20
O. speciosa	--	1.67	--	--	--	--	--	41	.32
Phlibostroma quadrimaculatum	.02	2.68	--	--	--	--	--	67	.52
Phoetaliotes nebrascensis	.02	1.46	--	.38	--	.15	--	46	.35
Pseudopomala brachyptera	--	.12	--	--	--	--	--	3	.02
Schistocerca alutacea	--	--	.09	--	--	--	--	1	.01
S. lineata	.02	.12	.09	--	--	--	--	5	.04
Spharagemon collare	.20	.65	.18	.10	.29	.29	.42	37	.29
S. equale	.10	.57	.18	.33	--	.29	.21	31	.24
Syrbula admirabilis	--	.04	--	--	--	--	--	1	.01
Trachyrhachis kiowa kiowa	.04	1.55	--	--	--	.15	--	41	.32
Nymphs	2/ 26.64	6.71	8.92	14.41	7.55	3/ 15.74	12.16	2168	16.71
Total specimens per environment	5,092	2,458	1,110	2,095	1,047	686	477	12,965	--

1/ Potatoes, beets, cane, wheat, corn, and alfalfa.
2/ Approx. 2,000 second-generation nymphs found in alfalfa; not included in percentages.
3/ 111 second-generation nymphs found in idle land; not included in percentages.

NEBRASKA

The percentages of individuals of the various species present in Nebraska, arranged according to crops infested, are summarized as follows:

Alfalfa

		Percent
1.	Melanoplus mexicanus	28
2.	M. bivittatus	13
3.	M. differentialis	12
4.	M. femur-rubrum	7
5.	Aeoloplus t. bruneri	3
6.	27 other species	37
	Nymphs - 27	

Plains grassland

		Percent
1.	Melanoplus mexicanus	29
2.	Ageneotettix deorum	18
3.	Mermiria maculipennis	5
4.	Aulocara elliotti	5
5.	Melanoplus f. foedus	3
6.	41 other species	40
	Nymphs - 7	

Roadside

1.	Melanoplus mexicanus	29
2.	M. differentialis	19
3.	M. bivittatus	13
4.	Aeoloplus t. bruneri	5
5.	M. bowditchi	5
6.	22 other species	29
	Nymphs - 9	

Small grain

1.	Melanoplus mexicanus	46
2.	M. differentialis	8
3.	M. bivittatus	7
4.	Aulocara elliotti	7
5.	Ageneotettix deorum	3
6.	22 other species	29
	Nymphs - 14	

Corn

1.	Melanoplus mexicanus	31
2.	M. differentialis	30
3.	M. bivittatus	19
4.	M. packardii	3
5.	M. femur-rubrum	1
6.	14 other species	16
	Nymphs - 8	

Idle land

1.	Melanoplus mexicanus	29
2.	M. differentialis	13
3.	M. bivittatus	8
4.	M. femur-rubrum	7
5.	Hesperotettix speciosus	6
6.	15 other species	37
	Nymphs - 16	

Miscellaneous crops

1.	Melanoplus mexicanus	25
2.	M. femur-rubrum	18
3.	M. bivittatus	17
4.	M. differentialis	9
5.	Aeoloplus t. bruneri	4
6.	14 other species	27
	Nymphs - 12	

Percentage of grand total

1.	Melanoplus mexicanus	32
2.	M. differentialis	11
3.	M. bivittatus	11
4.	Ageneotettix deorum	5
5.	M. femur-rubrum	5
6.	51 other species	36
	Nymphs - 17	

NEVADA

This is the first year that collections were made in Nevada during the adult survey. There were 2,487 specimens collected in 4 environments, with the range collection amounting to only 43 specimens. The collections were made in the irrigated-crop districts in what is designated as the northern desert-shrub area. These irrigated fields are subject to invasions from adjacent meadow grasses, where Camnula pellucida often breeds to great numbers locally. In the cropland listed here, Melanoplus devastator was recorded as the dominant species and formed over half of the specimens collected for the State.

General hatching was delayed by adverse weather until the end of May and continued through June. The outlook for 1939 shows Camnula pellucida numerous in grasslands adjacent to crops. Here, in a few places, the egg pods number as high as 350 per square foot.

Distribution by species of 2,487 specimens collected in Nevada, expressed in percentage of total number collected in each habitat

Species	Alfalfa clover	Meadow grass	Weeds brush	Range	Total specimens	Percentage of total
Ageneotettix deorum	--	--	0.50	--	1	0.04
Arphia pseudonietana	0.01	--	--	--	1	.04
Aulocara elliotti	.01	--	--	--	1	.04
Aulocara sp.	.02	6.15	.50	--	23	.92
Camnula pellucida	.57	72.00	.99	--	247	9.93
Conozoa sulcifrons Scudd.	5.93	--	8.45	--	131	5.27
Conozoa sp.	.99	--	--	--	19	.76
Chortippus longicornis	.78	1.85	--	--	21	.84
Dissosteira carolina	.01	--	--	--	1	.04
Melanoplus bivittatus	.88	.31	.99	--	20	.80
M. devastator	63.86	1.54	59.64	90.68	1392	55.95
M. femur-rubrum	8.63	6.46	3.48	--	194	7.80
M. mexicanus	.31	--	--	--	6	.24
M. packardii	6.29	4.31	6.96	--	149	5.99
M. sp.	.31	.62	--	--	8	.32
Oedaleonotus enigma	--	--	--	2.33	1	.04
Phoetaliotes nebrascensis	.62	--	--	--	12	.48
Schistocerca shoshone Thos.	.94	--	--	--	18	.72
S. lineata	--	--	.50	--	1	.04
Spharagemon collare	.01	--	--	--	2	.08
Trachyrhachis K. kiowa	--	.62	--	--	2	.08
Trimerotropis caeruleipennis Brun.	.01	--	--	--	1	.04
T. pallidipennis	2.03	2.77	16.40	--	81	3.26
Trimerotropis sp.	.02	.31	--	--	5	.20
Undetermined specimens	.47	2.77	--	2.33	19	.76
Nymphs	6.50	.31	1.49	4.65	131	5.27
Total specimens per environment	1,918	325	201	43	2,487	--

NEVADA

The percentages of individuals of the various species present in Nevada, arranged according to crops infested, are summarized as follows:

Alfalfa clover	Percent
1. Melanoplus devastator	64
2. M. femur-rubrum	9
3. M. packardii	6
4. Conozoa sulcifrons	6
5. Trimerotropis pallidipennis	2
6. 15 other species	6
7. Undetermined species	0.5
8. Nymphs	6.5

Meadow grass	Percent
1. Camnula pellucida	72
2. Melanoplus femur-rubrum	6
3. Aulocara sp.	6
4. M. packardii	4
5. Trimerotropis pallidipennis	3
6. 6 other species	5
7. Undetermined species	3
8. Nymphs	1

Weeds and brush	
1. Melanoplus devastator	60
2. Trimerotropis pallidipennis	16
3. Conozoa sulcifrons	8
4. Melanoplus packardii	7
5. M. femur-rubrum	3
6. 5 other species	4.5
7. Nymphs	1.5

Range	
1. Melanoplus devastator	91
2. Oedaleonotus enigma	2
3. Undetermined species	2
4. Nymphs	5

Grand total

	Percent
1. Melanoplus devastator	56
2. Camnula pellucida	10
3. M. femur-rubrum	8
4. M. packardii	6
5. Conozoa sulcifrons	5
6. 19 other species	10
7. Nymphs	5

NEW MEXICO

This is the second year in which collections were made in New Mexico during the adult survey. There were 3,526 specimens collected in 7 environments in which 58 species were represented. The dominant species, so far as economic importance is concerned, was Dissosteira longipennis, although this does not show up in the collections. Melanoplus femur-rubrum was the dominant species in alfalfa, corn, idle land, beans, and garden crops. M. mexicanus was the most numerous species in small grains.

Hatching of D. longipennis began about May 1, and continued through June. In the mid-Rio Grande area where M. femur-rubrum, M. differentialis, and M. bivittatus were dominant, hatching began the last week of April. In all areas, hatching was prolonged because of weather conditions.

From the 1938 fall survey it was determined that an area of 1,205,640 acres is known to contain egg beds of D. longipennis, which will produce as large an infestation in 1939 as in 1938, perhaps larger.

Distribution by species of 3,526 specimens collected in New Mexico, expressed in percentage of total numbers collected in each habitat

Species	Grain	Legumes	Range	Corn	Garden	Idle land	Beans	Total specimens	Percentage of total
Aeoloplus turnbullii bruneri	--	--	0.10	--	--	--	--	2	0.06
Ageneotettix deorum	0.58	--	3.80	1.83	--	0.89	1.26	85	2.41
Arphia pseudonietana	--	0.17	.61	--	--	--	--	13	.36
Aulocara elliotti	1.17	--	1.00	.61	--	.59	1.26	27	.76
Boopedon nubilum	--	--	.30	--	--	--	--	6	.17
Brachystola magna	--	--	.05	--	--	--	--	1	.03
Campylacantha olivacea vivax	.58	.17	.36	.91	--	1.79	--	18	.51
Camnula pellucida	--	--	.05	--	--	--	--	1	.03
Cordillacris crenulata	--	--	2.88	--	--	--	--	56	1.58
C. occipitalis	--	--	.72	--	--	--	--	14	.39
Crytapedes neglectus	.58	--	--	--	--	--	--	1	.03
Dactylotum pictum	--	--	.20	--	--	--	--	4	.11
Derotmema sp.	--	--	.50	--	--	--	--	10	.28
D. laticinctum Scudd.	--	--	.05	--	--	--	--	1	.03
D. haydenii	.58	--	1.85	--	--	.89	--	40	1.13
Dissosteira carolina	.58	--	--	--	--	--	1.26	2	.06
D. longipennis	1.17	--	15.43	--	--	--	--	302	8.56
Drepanopterna femoratum	--	--	7.09	.61	--	1.49	1.26	146	4.14
Encoptolophus sordidus costalis	.58	.17	4.11	.61	--	--	2.53	87	2.46
Hadrotettix trifasciatus	--	--	.87	--	--	--	--	17	.48
Hesperotettix viridis	.58	--	.05	--	--	--	--	2	.06
Deprus sp.	--	--	.15	--	--	--	--	3	.08
Melanoplus angustipennis	--	--	.46	--	--	--	--	9	.25
M. arizonae Scudd.	--	--	.87	2.14	--	2.38	--	32	.90
M. bivittatus	5.29	2.91	--	9.17	7.90	--	3.79	66	1.87
M. bowditchi	4.70	.51	.30	.30	--	.59	--	20	.56
M. differentialis	1.17	16.63	.36	25.38	26.13	2.38	8.86	227	6.43
M. femur-rubrum	17.64	53.00	.77	28.74	38.63	51.34	48.10	692	19.62
M. foedus foedus	4.70	--	.25	--	--	--	--	13	.36
M. gladstoni	4.11	.17	7.97	1.52	--	.89	1.26	172	4.87
M. infantilis	--	--	.46	--	--	--	--	9	.25

Species	Grain	Legumes	Range	Corn	Garden	Idle land	Beans	Total specimens	Percentage of total
Melanoplus lakinus	15.88	9.43	.66	7.95	10.22	12.83	18.98	188	5.33
M. mexicanus	30.58	2.40	1.64	--	--	2.98	--	108	3.06
M. occidentalis	--	--	1.08	.61	--	.89	2.53	28	2.79
M. packardii	2.35	.17	4.37	3.85	--	1.19	--	104	2.94
M. pictus Scudd.	--	--	.05	--	--	--	--	1	.03
M. regalis	--	--	.36	--	--	--	--	7	.19
Mestobregma plattei	--	--	.40	--	--	--	--	8	.22
Mermiria maculipennis	--	--	.05	--	--	--	--	1	.03
Metator pardalinus	--	--	.25	--	--	--	--	5	.14
Opeia obscura	--	--	5.04	--	--	3.28	--	109	3.09
Orphulella pelidna	--	--	--	.61	--	--	--	2	.06
Phlibostroma quadrimaculatum	--	--	5.55	.30	--	1.19	--	113	3.20
Phoetaliotes nebrascensis	--	.34	--	.30	--	.59	--	5	.14
Psoboessa sp.	.58	--	--	--	--	--	--	1	.03
Schistocerca lineata	--	.17	.99	1.83	--	--	--	26	.73
Spharagemon collare	--	.17	.15	.30	--	--	1.26	6	.17
S. equale	--	--	.30	--	--	--	--	6	.17
Syrbula admirabilis	--	--	.10	--	--	--	--	2	.06
Trachyrhachis k. kiowa	--	--	3.39	--	--	--	--	66	1.87
T. k. fuscifrons	--	.17	--	--	--	--	--	1	.03
Trachyrhachis sp.	--	--	1.33	--	--	--	--	26	.73
Trimerotropis gracilis Thos.	--	--	.05	--	--	--	--	1	.03
T. laticincta	--	--	.90	--	--	.59	--	20	.56
T. melanoptera	--	--	2.00	--	--	--	--	39	1.10
T. pallidipennis	--	1.20	1.59	.61	--	--	2.53	42	1.19
Tropidolophus formosus Say	--	--	.51	.30	--	--	--	12	.34
Xanthippus corallipes	--	--	.15	--	--	--	--	3	.08
Undetermined	--	--	1.38	.61	--	.59	--	31	.87
Nymphs	6.47	12.00	15.79	11.62	17.04	12.53	5.06	487	13.81
Total specimens per environment	170	583	1,944	327	88	335	79	3,526	--

NEW MEXICO

The percentages of individuals of the various species present in New Mexico, arranged according to crops infested, are summarized as follows:

Grains	Percent
1. Melanoplus mexicanus	31
2. M. femur-rubrum	18
3. M. lakinus	16
4. M. foedus foedus	5
5. M. gladstoni	4
6. Other species (14)	20
7. Nymphs	6

Legumes	Percent
1. Melanoplus femur-rubrum	53
2. M. differentialis	17
3. M. lakinus	9
4. M. bivittatus	3
5. M. mexicanus	2
6. Other species (11)	4
7. Nymphs	12

Range	
1. Dissosteira longipennis	15
2. M. gladstoni	8
3. Drepanopterna femoratum	7
4. Phlibostroma quadrimaculatum	6
5. Opeia obscura	5
6. Other species (46)	42
7. Nymphs and unidentified	17

Corn	
1. Melanoplus femur-rubrum	29
2. M. differentialis	35
3. M. bivittatus	9
4. M. lakinus	8
5. M. packardii	3
6. Other species	13
7. Nymphs and unidentified	13

Garden	
1. Melanoplus femur-rubrum	39
2. M. differentialis	26
3. M. lakinus	10
4. M. bivittatus	8
5. Nymphs	17

Idle	
1. Melanoplus femur-rubrum	51
2. M. lakinus	13
3. Opeia obscura	3
4. M. mexicanus	3
5. M. differentialis	2
6. Other species (13)	14
7. Nymphs and unidentified	14

Beans	
1. Melanoplus femur-rubrum	48
2. M. lakinus	19
3. M. differentialis	9
4. M. bivittatus	4
5. Other species (9)	15
6. Nymphs	5

Summary	
1. Melanoplus femur-rubrum	20
2. Dissosteira longipennis	9
3. M. differentialis	6
4. M. lakinus	5
5. M. gladstoni	5
6. Other species (53)	40
7. Nymphs and unidentified	15

NORTH DAKOTA

During the last 5 years, 1934-38, inclusive, collections of grasshoppers in typical environments have been made in North Dakota during the adult survey. In 1938, 20,634 specimens were collected in 9 typical environments, 41 species being represented in these collections. In all environments Melanoplus mexicanus was easily the dominant grasshopper making up half of the total specimens collected in the State. It far outnumbered any of the other species, forming from 24 to 68 percent of the populations in the different habitats. M. packardii was second in number in the total number of specimens collected, although Camnula pellucida and Agenceotettix deorum were greater in numbers than was M. packardii in some of the environments. In 1934, M. mexicanus was the dominant species on the range in the northwestern part of the State and A. deorum was the most numerous in the southwestern quarter. During 1935, 1936, and 1937, A. deorum became the leading species on the range, easily outnumbering M. mexicanus. In 1938 M. mexicanus became the most important species on the range land at 32 percent and A. deorum was second at 18 percent of the total specimens collected. This was probably due to the extensive major and local migrations of M. mexicanus during July and August. M. bivittatus is building up again after its great reduction during the extreme drought of 1934. M. differentialis, not being as hardy as M. bivittatus, is still down in numbers.

Hatching began about April 23 in the southern counties. Cold rainy weather prolonged hatching and hatching was still going on in the northern counties at the end of June. During July and the first part of August major flights of M. mexicanus moved in and out of the State. Grasshoppers in the south-central counties moved into the northeastern part of the State. Those in the western part moved northward into Canada and northwestward into eastern Montana. Grasshoppers from South Dakota moved northwestward into the Dickinson-Mandan area, reinfesting a large area there and destroying small-grain crops by cutting off the heads. Flights were so general and so dense that it was impossible to do anything about it. Heavy egg deposition occurred in areas where these flights terminated, although beefly larvae, according to the egg survey, had reduced the good eggs 25 to 75 percent. The worst infestations are in the Dickinson-Mandan area and egg counts run high. It is problematical how much good the egg predators will do. This is an old grasshopper area and egg predators are well established. They may at least cut down on the occurrence of the enormous populations necessary to produce major flights, such as those experienced in 1938.

Distribution by species of 20,634 specimens collected in North Dakota, expressed in percentage of total number collected in each habitat

Species	Percentage collected in--									Total specimens	Percentage of grand total
	Small grain	Legumes	Pasture	Reversion	Roadside: Weedy	Roadside: Soddy	Range	Corn	Flax		
Acrolophitus hirtipes	--	--	--	--	--	--	0.06	--	--	1	0.01
Aeoloplus turnbullii turnbullii	--	--	--	.71	1.65	--	--	0.23	--	54	.21
Aeropedellus clavatus	--	0.03	1.08	.04	.10	1.07	.36	--	--	46	.22
Ageneotettix deorum	0.40	1.14	4.71	4.52	1.36	18.93	18.29	.23	--	724	3.51
Amphitornus coloradus	.05	.03	1.89	.08	.39	4.80	4.62	.12	--	166	.80
Aulocara elliotti	.23	.06	.40	.40	1.69	5.60	5.94	.12	--	195	.94
Bruneria brunnea	--	--	--	--	--	.27	--	--	--	1	.01
Camnula pellucida	1.95	2.68	14.34	1.51	3.10	12.27	2.76	1.39	1.13	851	4.12
Chloealtis conspersa	--	--	--	.08	--	.27	--	--	--	3	.01
Chortippus longicornis	.05	.09	1.78	.24	--	--	.48	.35	.23	77	.37
Cordillacris occipitalis	--	--	--	--	.05	--	.18	--	--	4	.02
Derotmema haydenii haydenii	--	.03	--	.04	.24	--	--	--	--	7	.03
Dissosteira carolina	.20	--	--	.04	.63	.53	.42	.35	--	39	.19
Drepanopterna femoratum	.02	--	--	--	.10	.27	.18	--	--	7	.03
Encoptolophus sordidus sordidus	--	--	--	.04	--	--	--	--	--	1	.01
E. s. costalis	.02	--	--	--	--	--	--	--	--	1	.01
Hadrotettix trifasciatus	--	--	--	.32	.53	--	.54	.12	--	29	.14
Hesperotettix viridis	.02	.03	.40	.67	.48	.27	.66	--	--	53	.26
Hypochlora alba	--	--	.17	.08	.05	--	--	--	--	8	.04
Melanoplus angustipennis	1.58	.30	1.38	.99	2.91	--	.24	2.20	--	260	1.26
M. bivittatus	2.50	2.92	1.14	2.26	3.97	.80	.90	6.82	1.35	513	2.48
M. confusus	--	--	.10	.12	.34	.27	.30	--	--	19	.09
M. dawsoni	.13	.03	1.58	2.38	.05	.27	.42	--	--	125	.61
M. differentialis	.25	--	--	--	--	--	--	--	--	16	.08
M. femur-rubrum	1.75	.93	.88	1.62	.73	--	.12	--	1.81	235	1.14
M. flavidus flavidus	--	--	--	--	.10	--	--	--	--	2	.01
M. gladstoni	--	--	--	.04	--	--	--	--	--	1	.01
M. infantilis	.06	.21	1.28	.32	.19	1.33	3.66	.23	--	129	.62
M. mexicanus	60.03	41.24	33.03	50.72	55.05	23.73	31.67	61.38	67.72	10,058	48.68
M. occidentalis	--	--	--	.04	.14	--	.42	--	--	11	.05

NORTH DAKOTA (Continued)

Species	Percentage collected in--									Total specimens	Percentage of grand total
	Small grain	Legumes	Pasture	Reversion	Roadside: Weedy	Roadside: Soddy	Range	Corn	Flax		
Melanoplus packardii	8.02	4.60	1.65	4.32	4.99	5.07	2.04	6.01	1.81	1,040	5.03
Mermiria maculipennis macclungi	--	--	--	--	.19	--	.06	--	--	5	.02
Metator pardalinus	.09	--	1.68	.52	1.69	3.20	6.54	.12	--	226	1.09
Opeia obscura	--	--	--	--	--	--	.06	--	--	1	.01
Orphulella speciosa	--	--	.07	--	--	--	.18	--	--	5	.02
Pardalophora haldemanii	--	--	--	--	--	--	.30	--	--	5	.02
Phlibostroma quadrimaculatum	--	--	.10	--	.10	2.93	4.44	--	--	90	.44
Phoetaliotes nebrascensis	--	--	--	--	.05	--	--	--	--	1	.01
Spharagemon collare	.64	.36	.54	.59	.82	.27	.24	.23	.23	109	.53
S. equale	--	.03	--	.08	.19	--	.06	--	--	3	.04
Trachyrhachis kiowa	--	.09	1.38	.16	.19	.80	2.10	--	--	90	.44
Nymphs	21.96	45.18	30.40	27.07	17.92	17.07	11.76	20.11	25.73	5411	26.19
Total specimens per environment	6,395	3,324	2,970	2,523	2,065	375	1,667	865	443	20,627	--

NORTH DAKOTA

The percentages of individuals of the various species present in North Dakota, arranged according to crops infested, are summarized as follows:

Small grain	Percent
1. Melanoplus mexicanus	60
2. M. packardii	8
3. M. bivittatus	3
4. Camnula pellucida	2
5. M. femur-rubrum	2
6. 15 other species	25
Nymphs - 22	

Legumes	Percent
1. Melanoplus mexicanus	41
2. M. packardii	5
3. M. bivittatus	3
4. Camnula pellucida	3
5. Ageneotettix deorum	1
6. 13 other species	47
Nymphs - 45	

Pasture	
1. Melanoplus mexicanus	33
2. Camnula pellucida	14
3. Ageneotettix deorum	5
4. Amphitornus coloradus	2
5. M. packardii	2
6. 18 other species	44
Nymphs - 30	

Reversion	
1. Melanoplus mexicanus	51
2. Ageneotettix deorum	5
3. M. packardii	4
4. M. dawsoni	2
5. M. bivittatus	2
6. 25 other species	36
Nymphs - 27	

Weedy roadside	
1. Melanoplus mexicanus	55
2. M. packardii	5
3. M. bivittatus	4
4. Camnula pellucida	3
5. M. angustipennis	3
6. 20 other species	30
Nymphs - 18	

Soddy roadside	
1. Melanoplus mexicanus	24
2. Ageneotettix deorum	19
3. Camnula pellucida	12
4. Aulocara elliotti	6
5. M. packardii	5
6. 15 other species	34
Nymphs - 17	

Range	
1. Melanoplus mexicanus	32
2. Ageneotettix deorum	18
3. Metator pardalinus	7
4. Aulocara elliotti	6
5. Amphitornus coloradus	5
6. 26 other species	32
Nymphs - 12	

Corn	
1. Melanoplus mexicanus	61
2. M. bivittatus	7
3. M. packardii	6
4. M. angustipennis	2
5. Camnula pellucida	1
6. 10 other species	23
Nymphs - 20	

Flax	
1. Melanoplus mexicanus	68
2. M. femur-rubrum	2
3. M. packardii	2
4. M. bivittatus	1
5. Camnula pellucida	1
6. 2 other species	26
Nymphs - 26.	

Grand total	
1. Melanoplus mexicanus	49
2. M. packardii	5
3. Camnula pellucida	4
4. Ageneotettix deorum	4
5. M. bivittatus	2
6. 40 other species	36
Nymphs - 26	

OKLAHOMA

This is the second year in which collections were made in Oklahoma during the adult survey. In 1937 a special project was set up by the entomology department of the A & M College at Stillwater, whereby collections of hoppers were made and classified in specified environments. These, added to the collections made by surveyors in the adult survey, gave a complete picture of the distribution of species in the State that year. In 1938 the regular surveyors made the collections and only about half as many were collected as in 1937. There were 4,820 specimens collected in 9 environments and 53 species were represented. About 2 percent of the total specimens collected were undetermined nymphs. In everything but the range land the dominant species was Melanoplus differentialis. Outside of the Panhandle counties M. packardii was the most numerous species on the prairie. In the crop land M. differentialis made up one-half of the grasshoppers. M. mexicanus was second only in the alfalfa, with M. packardii second in numbers for small grains and probably other crops. There seems to be little change in the relative numbers of the more important species. Aulocara elliotti does not seem to have been so numerous in 1938 as in 1937, but Aeoloplus turnbullii has increased in importance. In the extreme western counties of the Panhandle, Dissosteira longipennis moved in late in July and deposited eggs along fence rows of cropped areas and in the corn and sorghum stubble, as well as a small portion of the range land.

Hatching of M. bivittatus and M. mexicanus began the last of March, adults of M. mexicanus being noted by the first week of May. Owing to continuous rains, fungous and bacterial disease reduced the population. The grasshopper potential for the fall of 1938 is about half what it was in 1937. In 1939 the greatest trouble will probably be in the Panhandle area, where D. longipennis is dominant.

Distribution by species of 4,820 specimens collected in Oklahoma, expressed in percentage of total number collected in each habitat

Species	Percentage collected in --										Total specimens	Percentage of grand total
	Range	Alfalfa	Small grain	Weedy patches	Misc. crops 1/	Sorghums	Roadside	Cotton	River bottom	Corn		
Aeoloplus turnbullii bruneri	0.52	3.83	2.06	14.26	1.99	0.93	2.45	3.91	1.60	--	160	3.32
Ageneotettix deorum	3.56	.26	.15	.39	--	.23	--	--	7.45	--	54	1.12
Amphitornus coloradus	.52	--	--	--	--	--	--	--	--	--	5	.10
Arphia simplex	.10	.13	--	--	.40	--	--	--	--	--	4	.08
Aulocara elliotti	3.98	--	2.51	.19	.40	.47	.92	--	--	--	63	1.31
Boopedon maculatum	1.99	--	.15	--	--	.23	--	--	--	--	21	.44
B. nubilum	.10	--	--	--	.20	--	--	--	--	--	2	.04
Brachystola magna	--	--	--	--	--	--	.31	--	--	--	1	.02
Campylacantha o. olivacea	.18	--	--	.19	--	--	.61	--	--	--	4	.08
Chortophaga viridifasciata	.84	.26	1.03	--	--	.23	--	.98	--	1.53	23	.48
Dissosteira carolina	.10	.26	--	.19	.20	--	--	--	--	--	5	.10
Dissosteira longipennis	1.57	--	.88	1.35	--	1.40	1.22	1.95	--	--	44	.91
Encoptolophus pallidus subgracilis Caud.	--	--	.74	--	.20	--	--	1.95	--	--	12	.25
Hadrotettix trifasciatus	3.56	--	.29	.39	.40	.70	.92	--	--	--	46	.95
Hesperotettix speciosus	1.15	.51	1.18	1.16	.60	1.40	3.98	2.28	2.13	.76	63	1.31
H. viridis	1.57	--	.44	2.31	--	--	.61	.65	.53	--	35	.73
Hippiscus rugosus	1.68	--	.29	--	--	--	--	--	--	--	18	.37
Hypochlora alba	.21	--	--	--	--	--	--	--	--	--	2	.04
Melanoplus angustipennis impiger Scudd.	4.40	3.57	2.21	1.35	1.79	6.74	3.06	1.30	13.30	3.05	173	3.59
M. arizonae	2.20	.26	.15	.77	--	.93	--	--	--	1.53	34	.71
M. bispinosus Scudd.	.42	1.28	.29	.19	.20	--	.31	.33	--	.76	21	.44
M. bivittatus	3.35	8.05	7.08	9.25	6.96	4.88	10.09	3.58	6.91	12.21	320	6.64
M. bowditchi	--	--	--	--	--	--	.61	--	--	--	2	.04
M. differentialis	6.08	45.85	44.69	34.10	49.30	52.09	34.25	47.56	19.68	49.62	1729	35.86
M. femur-rubrum	--	--	.15	--	--	--	--	--	2.66	--	6	.12
M. flavidus	.10	--	.29	1.16	.40	--	1.22	.33	--	1.53	18	.37
M. f. fluviatilis	--	.13	--	.39	--	--	--	--	1.06	3.05	9	.19
M. f. foedus	.21	--	.74	3.08	.80	.23	--	.65	1.60	--	33	.68

OKLAHOMA (Continued)

Species	Percentage collected in--										Total specimens	Percentage of grand total
	Range	Alfalfa	Small grain	Weedy patches	Misc. crops[1]	Sorghums	Roadside	Cotton	River bottom	Corn		
Melanoplus foedus iselyi	2.20	2.43	2.80	.96	6.16	3.49	3.98	1.30	16.49	11.45	173	3.59
M. glaucipes Scudd.	.52	--	--	--	--	.47	.31	--	1.06	.76	11	.23
M. lakinus	.31	1.02	1.33	4.43	1.39	.47	.92	1.63	.53	--	61	1.27
M. mexicanus	2.83	15.45	3.54	8.28	2.39	4.42	10.40	1.63	3.72	--	292	6.06
M. packardii	28.72	8.30	19.03	14.45	22.27	15.35	20.80	14.33	9.57	4.58	857	17.77
M. ponderosus Scudd.	1.68	.13	.15	--	--	--	.31	--	.53	4.58	26	.54
M. regalis Dodge	.84	--	.15	--	--	--	--	--	--	--	9	.19
Mermiria maculipennis	6.81	.13	1.77	--	1.59	1.40	.61	1.63	4.79	--	108	2.38
M. neomexicana	.21	--	--	--	--	--	.31	--	--	--	3	.06
Opeia obscura	.52	--	--	--	--	--	--	--	--	--	5	.10
Orphulella speciosa	.21	.13	--	--	--	--	--	.65	--	--	5	.10
Pardalophora haldemanii	.31	.13	.15	--	--	--	--	--	--	--	5	.10
Xanthippus corallipes pantherinus Scudd.	1.89	.13	--	.19	.40	.47	--	.98	--	--	27	.56
Phlibostroma quadrimaculatum	6.39	--	--	--	--	--	--	--	--	--	61	1.27
Schistocerca a. americana	--	.13	.29	--	--	--	--	--	--	--	3	.06
S. obscura	--	--	--	--	--	--	--	3.58	--	1.53	13	.27
S. shoshone	--	--	--	--	--	--	--	.33	--	--	1	.02
S. lineata	.10	--	.29	--	--	.23	--	1.30	.53	--	9	.19
Spharagemon collare	.42	.26	.29	--	--	.23	.31	.33	1.60	1.53	16	.33
S. equale	1.05	.26	1.33	.77	1.39	.47	--	.33	--	--	35	.73
Syrbula admirabilis	4.09	.77	.88	.19	--	.47	.92	3.26	3.19	--	73	1.51
Trachyrhachis kiowa fuscifrons	.10	--	--	--	--	--	--	--	--	--	1	.02
Trimerotropis latifasciata laticincta	--	--	--	--	.40	--	--	.33	--	--	3	.06
T. pallidipennis	--	--	--	--	--	.23	.31	--	--	--	2	.04
T. citrina Scudd.	--	--	--	--	--	--	--	.98	1.06	1.53	7	.15
Undetermined	.31	.38	.88	--	.20	1.40	.31	.98	--	--	23	.48
Nymphs	2.10	6.00	1.77	--	--	.47	--	.98	--	--	84	1.74
Total specimens per environment	954	783	678	519	503	430	327	307	188	131	4,820	--

1/ Sorghum, cotton, wheat, corn, and alfalfa.

OKLAHOMA

The percentages of individuals of the various species present in Oklahoma, arranged according to crops infested, are summarized as follows:

Range	Percent
1. Melanoplus packardii-------	29
2. Mermiria maculipennis------	7
3. Phlibostroma quadrimaculatum	6
4. Melanoplus differentialis--	6
5. M. angustipennis impiger---	4
6. 38 other species----------	48
Nymphs - 2	

Alfalfa	Percent
1. Melanoplus differentialis----	46
2. M. mexicanus----------	15
3. M. packardii----------	8
4. M. bivittatus----------	8
5. Acoloplus t. bruneri---------	4
6. 20 other species----------	19
Nymphs - 6	

Small grain	
1. Melanoplus differentialis--	45
2. M. packardii----------	19
3. M. bivittatus----------	7
4. M. mexicanus----------	4
5. M. f. iselyi----------	3
6. 27 other species----------	22
Nymphs - 2	

Weedy patches	
1. Melanoplus differentialis----	34
2. M. packardii----------	14
3. Acoloplus t. bruneri---------	14
4. M. bivittatus----------	9
5. M. mexicanus----------	8
6. 19 other species----------	21
Nymphs - none	

Miscellaneous crops	
1. Melanoplus differentialis--	49
2. M. packardii----------	22
3. M. bivittatus----------	7
4. M. f. iselyi----------	6
5. M. mexicanus----------	2
6. 18 other species----------	14
Nymphs - none	

Sorghums	
1. Melanoplus differentialis----	52
2. M. packardii----------	15
3. M. a. impiger----------	7
4. M. bivittatus----------	5
5. M. mexicanus----------	4
6. 20 other species----------	17
Nymphs - 0.47	

Roadside	
1. Melanoplus differentialis--	34
2. M. packardii----------	21
3. M. mexicanus----------	10
4. M. bivittatus----------	10
5. M. f. iselyi----------	4
6. 20 other species----------	21
Nymphs - none	

Cotton	
1. Melanoplus differentialis----	48
2. M. packardii----------	14
3. Acoloplus t. bruneri---------	4
4. M. bivittatus----------	4
5. Schistocerca obscura---------	4
6. 24 other species----------	26
Nymphs - 0.98	

River bottom	
1. Melanoplus differentialis--	20
2. M. f. iselyi----------	16
3. M. a. impiger----------	13
4. M. packardii----------	10
5. Ageneotettix deorum--------	7
6. 16 other species----------	34
Nymphs - none	

Corn	
1. Melanoplus differentialis----	50
2. M. bivittatus----------	12
3. M. f. iselyi----------	11
4. M. packardii----------	5
5. M. ponderosus----------	5
6. 11 other species----------	17
Nymphs - none	

OKLAHOMA (Continued)

Percentage of grand total

1.	Melanoplus differentialis-------	36
2.	M. packardii-------------------	18
3.	M. bivittatus-------------------	7
4.	M. mexicanus-------------------	6
5.	M. angustipennis impiger--------	4
6.	48 other species---------------	29

Nymphs - 1.74

OREGON

This is the first year that collections from Oregon were included in this project. The natural vegetation areas found in this State are the northern desert shrub in the eastern half and the western pine forest in the western half. There were 1,096 specimens collected in 4 environments in which 13 species are represented. Melanoplus mexicanus was the dominant species by far, except in the marsh-meadow land, where Cammula pellucida was dominant. M. foedus foedus was third in numbers.

Hatching began late in May and continued through June. Infestations are of M. mexicanus and Cammula pellucida and occur in widely separated areas. C. pellucida on the Klamath Marsh has been greatly reduced by the control campaign. This is the area where this species reaches its greatest numbers.

Distribution by species of 1,096 specimens collected in Oregon, expressed in percentage of total numbers collected in each habitat

Species	Alfalfa and clover	Small grain	Idle land	Meadow marsh	Total specimens	Percentage of total
Aulocara elliotti----------	0.48	1.73	1.86	--	9	0.82
Camnula pellucida----------	1.44	.43	--	94.16	139	12.68
Conozoa sp.----------	7.68	.86	18.69	--	70	6.38
Dissosteira carolina--------	5.44	--	--	--	34	3.10
Melanoplus bivittatus-------	7.68	.43	--	--	49	4.47
M. cinereus Scudd.----------	.16	--	13.08	--	15	1.36
M. devastator----------	2.06	5.65	--	1.45	28	2.55
M. femur-rubrum----------	4.96	.86	--	--	33	3.01
M. foedus foedus----------	15.68	2.17	9.34	2.91	117	10.67
M. mexicanus----------	43.68	80.43	5.60	1.45	466	42.42
Oedaleonotus enigma---------	.96	--	51.40	--	61	5.56
Phoetaliotes nebrascensis---	.32	--	--	--	2	.18
Trimerotropis sp.----------	.16	--	--	--	1	.09
Undetermined----------	.32	--	--	--	2	.18
Nymphs----------	8.48	7.39	--	--	70	6.38
Total specimens per environment----------	622	230	107	137	1,096	--

OREGON

The percentages of individuals of the various species present in Oregon, arranged according to crops infested, are summarized as follows:

Alfalfa and clover	Percent
1. Melanoplus mexicanus	44
2. M. foedus foedus	16
3. Conozoa sp.	8
4. M. bivittatus	7
5. Dissosteira carolina	5
6. Other species (8) & unident.	11
7. Nymphs	9

Small grain	Percent
1. Melanoplus mexicanus	81
2. M. devastator	6
3. M. foedus foedus	2
4. Aulocara elliotti	2
5. Conozoa sp.	1
6. Other species (3) & Unident.	1
7. Nymphs	7

Idle land	
1. Oedaleonotus enigma	52
2. Conozoa sp.	18
3. Melanoplus cinereus	13
4. M. foedus foedus	9
5. M. mexicanus	6
6. Aulocara elliotti	2

Meadow marsh	
1. Camnula pellucida	95
2. Melanoplus foedus foedus	3
3. M. mexicanus	1
4. M. devastator	1

Summary

	Percent
1. Melanoplus mexicanus	43
2. Camnula pellucida	13
3. M. foedus foedus	11
4. Conozoa sp.	6
5. M. bivittatus	4
6. Other sp. (9) & unident.	17
7. Nymphs	6

SOUTH DAKOTA

During the adult surveys in 1934-38, inclusive, collections of grasshoppers have been made in the major environments found in South Dakota. There were 15,105 specimens collected in 1938 in 7 major environments, representing 47 different species. Melanoplus mexicanus was easily the dominant grasshopper, constituting 61 percent of the specimens collected in small grain and idle land, 37 percent in alfalfa, and 40 percent of the total number of specimens collected in the State. M. bivittatus was second in numbers for the entire State collection but was first, at 31 percent, in corn. Ageneotettix deorum and Aulocara elliotti were about equal in numbers, at third place. After the 1931 outbreaks of M. bivittatus and M. differentialis these two species were greatly reduced in numbers by the drought years which followed. Since that time M. mexicanus has been increasing in relative numbers every year, until it reached its peak in 1938. Populations of this species from 1,500 to 8,000 per square yard were recorded in crop land, idle land, and depleted range land adjacent to crops in the north-central counties. These produced major flights in July that swarmed into North Dakota, eastern Montana, western South Dakota, and eastern Wyoming. Fall egg surveys in 1938 indicated that this general movement has reduced the relative numbers of M. mexicanus in this and other areas in the eastern half of South Dakota and that there is an increase in both M. bivittatus and M. differentialis to equal or supplant M. mexicanus in importance. In the western counties M. mexicanus is still the dominant grasshopper, because this area received part of the great flights. There was heavy egg deposition in the Black Hills area. The Lyman, Tripp, and Gregory County area show M. differentialis as decidedly on the increase. This was the center of the 1931 outbreak. All through the eastern part of the State the fall egg surveys showed mixed populations of M. mexicanus, M. bivittatus, and M. differentialis.

Hatching began the last week of April and was prolonged throughout June. Flights began the last week of June and continued throughout July and part of August. These were mostly in a northerly, northwesterly, or westerly direction. The almost solid infestation east of Missouri River has been broken up into patchy mixed infestations.

Distribution by species of 15,105 specimens collected in South Dakota, expressed in percentage of total number collected in each habitat

Species	Percentage collected in--							Total specimens	Percentage of grand total
	Plains grassland	Small grain	Idle land	Weedy roadside	Legumes	Corn	Irrigation ditches		
Aeoloplus t. turnbullii	0.91	0.91	2.92	0.68	--	0.71	1.18	168	1.11
Aeropedellus clavatus	.04	--	--	--	--	--	--	2	.01
Ageneotettix deorum	20.08	2.55	1.72	3.59	2.59	.27	.59	1,139	7.54
Amphitornus coloradus	4.64	.27	.04	.20	--	--	--	224	1.48
Arphia pseudonietana	.04	.02	--	--	--	--	--	3	.02
Aulocara elliotti	18.00	6.28	2.06	4.67	1.65	.88	10.59	1,249	8.27
Boopedon nubilum	.16	--	--	--	--	--	--	7	.05
Camnula pellucida	.89	1.14	.04	--	.31	.80	.88	103	.68
Chortippus longicornis	.04	.02	--	.07	--	--	--	4	.03
Cordillacris crenulata	.09	--	--	--	--	--	--	4	.03
C. o. occipitalis	.44	--	--	--	--	--	--	20	.13
Dactylotum pictum	.02	--	--	--	--	--	--	1	.01
Derotmema haydenii	--	.07	.30	.34	--	.18	--	17	.11
Dissosteira carolina	--	.52	.04	--	--	.71	1.18	34	.23
Drepanopterna femoratum	1.49	.05	.09	.27	--	.09	--	76	.50
Hadrotettix trifasciatus	.20	.42	.17	1.08	.16	.35	.29	53	.35
H. speciosus	.18	.02	.04	.41	--	.62	4.41	38	.25
H. viridis	.55	.02	.09	2.91	.08	.27	.59	77	.51
Hippiscus rugosus	.02	--	--	--	--	--	--	1	.01
Hypochlora alba	.11	.02	--	--	--	--	.29	7	.05
Melanoplus angustipennis	.11	.30	.13	2.98	.16	.53	--	72	.48
M. bivittatus	1.38	6.84	7.72	12.87	11.37	31.24	23.82	1,288	8.53
M. confusus	.09	.25	.34	--	.39	.27	--	30	.20
M. dawsoni	.33	--	--	.07	.16	--	--	18	.12
M. differentialis	.33	1.43	.21	1.29	3.45	16.46	4.41	342	2.26
M. femur-rubrum	.44	1.80	1.89	2.71	7.76	.97	7.35	312	2.07
M. foedus fluviatilis	.42	.05	--	.07	--	--	.59	24	.16
M. foedus foedus	--	--	--	.07	--	--	--	1	.01
M. infantilis	1.31	.32	.34	.20	.24	.35	--	90	.60

Species	Percentage collected in--							Total specimens	Percentage of grand total
	Plains grassland	Small grain	Idle land	Weedy roadside	Legumes	Corn	Irrigation ditches		
Melanoplus lakinus Scudd.	0.02	0.27	0.30	0.27	--	0.09	--	24	0.16
M. mexicanus	15.04	61.23	60.57	37.47	37.10	26.99	22.35	5,975	39.55
M. occidentalis	.71	--	.17	.34	.08	--	--	42	.28
M. packardii	1.29	5.02	7.08	8.40	1.57	4.96	3.53	638	4.22
M. scudderi	--	--	--	--	--	--	.29	1	.01
Mermiria maculipennis macclungi	1.78	.02	--	4.54	--	.09	1.18	153	1.01
Mestobregma p. plattei	.29	.02	--	--	--	--	--	14	.09
Metator pardalinus	4.73	.40	.26	.75	--	.09	2.65	256	1.69
Opeia obscura	.27	--	--	--	--	--	--	12	.08
Orphulella pelidna	.02	--	--	--	--	--	--	1	.01
O. speciosa	2.51	--	--	--	--	--	--	113	.75
Pardalophora haldemanii	.07	.02	--	--	--	--	--	4	.03
Phlibostroma quadrimaculatum	.87	--	--	--	--	--	--	39	.26
Phoetaliotes nebrascensis	.98	.05	--	.68	--	--	--	56	.37
Spharagemon collare	.02	.64	.90	.14	.31	.27	--	57	.38
S. equale	1.15	1.48	1.20	.81	.39	.62	.88	167	1.11
Trachyrhachis k. kiowa	3.59	.10	.04	--	.16	--	--	169	1.12
Trimerotropis laticincta	--	.02	--	.07	--	.09	--	3	.02
Nymphs	14.36	7.36	11.33	12.06	32.08	12.12	12.94	1,977	13.09
Total specimens per environment	4,507	4,046	2,331	1,476	1,275	1,130	340	15,105	--

SOUTH DAKOTA

The percentages of individuals of the various species present in South Dakota, arranged according to crops infested, are summarized as follows:

Plains grassland

		Percent
1.	Ageneotettix deorum--------	20
2.	Aulocara elliotti----------	18
3.	Melanoplus mexicanus-------	15
4.	M. packardii---------------	5
5.	Amphitornus coloradus------	5
6.	37 other species----------	37
	Nymphs - 14	

Idle land

1.	Melanoplus mexicanus-------	61
2.	M. bivittatus--------------	8
3.	M. packardii---------------	7
4.	Aeoloplus t. turnbullii----	3
5.	Ageneotettix deorum--------	2
6.	20 other species----------	19
	Nymphs - 11	

Legumes

1.	Melanoplus mexicanus-------	37
2.	M. bivittatus--------------	11
3.	M. femur-rubrum------------	8
4.	M. differentialis----------	3
5.	Agencotettix deorum--------	3
6.	13 other species----------	38
	Nymphs - 32	

Irrigation ditches

1.	Melanoplus bivittatus------	24
2.	M. mexicanus---------------	22
3.	Aulocara elliotti----------	11
4.	M. femur-rubrum------------	7
5.	Hesperotettix speciosus----	4
6.	13 other species----------	32
	Nymphs - 13	

Small grain

1.	Melanoplus mexicanus-----	61
2.	M. bivittatus------------	7
3.	Aulocara elliotti--------	6
4.	M. packardii------------	5
5.	Ageneotettix deorum------	3
6.	28 other species---------	18
	Nymphs - 7	

Weedy roadside

1.	Melanoplus mexicanus-----	37
2.	M. bivittatus------------	13
3.	M. packardii-------------	8
4.	Aulocara elliotti--------	5
5.	Mermiria maculipennis macclungi---------------	5
6.	23 other species---------	32
	Nymphs - 12	

Corn

1.	Melanoplus bivittatus----	31
2.	M. mexicanus-------------	27
3.	M. differentialis--------	16
4.	M. packardii-------------	5
5.	M. femur-rubrum----------	1
6.	19 other species---------	20
	Nymphs - 12	

Grand total

1.	Melanoplus mexicanus-----	40
2.	M. bivittatus------------	9
3.	Aulocara elliotti--------	8
4.	Agencotettix deorum------	8
5.	M. packardii-------------	4
6.	42 other species---------	31
	Nymphs - 13	

TEXAS

This is the second year in which collections were made in Texas during the adult survey. There were 1,285 specimens collected in 6 different environments in which 54 species were represented. Most of these collections were made outside of the Dissosteira longipennis area proper and, coupled with the difficulty in collecting this species where it was not numerous, it is not represented in its true relative numbers in the data recorded here. In the collections the dominant species by far was Melanoplus differentialis, at 27 percent of the total number collected. Chortophaga viridifasciata was second at 9 percent, and Syrbula admirabilis was third, at 8 percent. It should be noted that common species like Melanoplus mexicanus, M. femur-rubrum, and M. bivittatus, do not show up in nearly the relative numbers that they do in the more northern States.

Hatching began in the latter part of March and, as in other States, was retarded and prolonged throughout April and May by cold and rainy weather. D. longipennis began to hatch about May 5 in the Panhandle counties and all were adult about July 1. Heavy migrations of D. longipennis occurred and spread the infestation over all or parts of 16 counties. Egg deposition was heavy in spots and the outlook for next year is worse than it was for 1938.

Distribution by species of 1,285 specimens collected in Texas, expressed in percentage of total numbers collected in each habitat

Species	Bottom sand	Roadside	Grain	Sudan, corn, sorghum	Pasture	Cotton margins	Total specimens	Percentage of total
Agoloplus turnbullii bruneri	--	1.01	3.07	--	--	--	5	0.38
Ageneotettix deorum	0.35	1.01	1.53	2.27	2.70	0.44	19	1.47
Arphia simplex	.35	--	--	4.54	1.62	--	15	1.16
A. xanthoptera	--	1.01	--	--	.27	--	2	.15
Aulocara elliotti	--	1.01	--	--	.54	--	3	.23
Boopedon maculatum	1.76	--	--	7.38	7.29	.44	46	3.57
Brachystola magna	.70	--	.76	5.11	.81	.44	16	1.24
Campylacantha olivacea	.70	3.03	--	--	1.08	--	9	.70
Chortophaga viridifasciata	10.91	1.01	40.00	5.11	4.05	5.30	120	9.33
Dactylotum pictum	--	2.02	--	--	.54	--	4	.31
Dissosteira carolina	--	--	--	--	--	1.32	3	.23
D. longipennis	--	5.05	2.30	12.50	3.51	1.76	47	3.65
Drepanopterna femoratum	--	--	--	--	.27	--	1	.07
Encoptolophus p. subgracilis	1.76	--	1.53	1.70	--	2.65	16	1.24
E. sordidus costalis	1.76	--	5.38	1.13	2.43	3.53	31	2.41
Hadrotettix trifasciatus	.35	2.02	1.53	--	5.67	1.76	30	2.33
Hesperotettix speciosus	3.87	--	1.53	1.13	1.35	1.32	23	1.78
H. viridis	.70	--	--	--	1.35	--	7	.54
Hippiscus rugosus	--	1.01	--	--	4.59	.88	20	1.55
Leprus sp.	--	--	--	--	.54	--	2	.15
Melanoplus angustipennis impiger	.35	--	1.53	--	.81	.44	7	.54
M. arizonae	--	5.05	.76	--	.27	--	7	.54
M. bispinosus Scudd.	.70	--	--	1.13	1.35	1.32	12	.93
M. bivittatus	--	7.07	--	--	--	--	7	.54
M. differentialis	35.21	35.35	10.76	34.09	7.29	49.11	347	27.00
M. femur-rubrum	2.46	1.01	--	--	1.89	1.32	18	1.40
M. f. flavidus	--	--	1.53	--	--	--	2	.15
M. foedus foedus	--	--	--	--	.54	--	2	.15
M. foedus iselyi	--	1.01	--	--	--	--	1	.07
M. glaucipes	--	--	--	--	1.08	--	4	.31

TEXAS (Continued)

Species	Bottom sand	Roadside	Grain	Sudan, corn, sorghum	Pasture	Cotton margins	Total specimens	Percentage of total
Melanoplus lakinus	--	11.11	--	--	1.35	--	16	1.24
M. mexicanus	--	--	6.92	--	--	0.88	11	.85
M. occidentalis	--	2.02	--	--	0.54	--	4	.31
M. packardii	--	5.05	1.53	1.13	4.32	1.76	29	2.25
M. ponderosus	1.05	--	--	--	1.08	1.32	10	.77
Mermiria maculipennis	2.46	6.06	7.69	4.54	8.91	3.53	72	5.60
Mestobregma p. plattei	--	--	--	--	.54	--	2	.15
Orphulella pellidna	--	--	--	1.13	.81	--	5	.38
O. speciosa	4.22	1.01	--	--	3.51	1.32	29	2.25
Paraidemona mimica Scudd.	1.05	--	--	--	--	--	3	.23
Phlibostroma quadrimaculatum	--	--	--	--	.54	--	2	.15
Phoetaliotes nebrascensis	.35	--	--	--	--	--	1	.07
Schistocerca americana	.35	1.01	--	1.13	1.62	1.32	13	1.01
S. lineata	--	--	--	3.40	.54	--	8	.62
S. obscura F.	1.05	1.01	--	--	--	2.21	9	.70
Sparagemon bolli Scudd.	--	--	--	--	.27	--	1	.07
S. cristatum cristatum Scudd.	--	2.02	--	.56	1.35	--	8	.62
S. equale	--	--	--	--	1.08	.88	6	.46
Syrbula admirabilis	13.02	1.01	4.61	9.09	7.02	7.96	104	8.09
Trachyrhachis k. fuscifrons	3.87	--	--	--	7.02	1.32	40	3.11
Trimerotropis l. laticincta	--	--	.76	--	--	--	1	.07
T. pallidipennis	--	--	--	--	--	.44	1	.07
Tropidolophus formosus	.70	--	--	--	--	--	2	.15
Xanthippus c. pantherinus	--	1.01	.76	--	.54	--	4	.31
Undetermined	3.87	--	2.30	2.27	1.62	1.76	28	2.17
Nymphs	5.98	1.01	3.07	.56	5.40	3.09	50	3.89
Total specimens per environment	284	99	130	176	370	226	1,285	--

TEXAS

The percentages of individuals of the various species present in Texas, arranged according to crops infested, are summarized as follows:

Bottom sand	Percent
1. Melanoplus differentialis----	35
2. Syrbula admirabilis----------	13
3. Chortophaga viridifasciata---	11
4. Orphulella speciosa----------	4
5. Hesperotettix speciosus------	4
6. Other species (20) and unident.	27
7. Nymphs----------	6

Roadside	Percent
1. Melanoplus differentialis----	35
2. M. lakinus----------	11
3. M. bivittatus----------	7
4. Mermiria maculipennis--------	6
5. Melanoplus packardii---------	5
6. Other species (20) and unident.	35
7. Nymphs----------	1

Grain	
1. Chortophaga viridifasciata---	40
2. Melanoplus differentialis----	11
3. Mermiria maculipennis--------	8
4. Melanoplus mexicanus---------	7
5. Encoptolophus sordidus costalis	5
6. Other species (14) and unident.	26
7. Nymphs----------	3

Sudan, corn, sorghum	
1. Melanoplus differentialis----	34
2. Dissosteira longipennis------	12
3. Syrbula admirabilis----------	9
4. Boopedon maculatum----------	7
5. Brachystola magna----------	5
6. Other species (13) and unident.	32
7. Nymphs----------	1

Pasture	
1. Mermiria maculipennis--------	9
2. M. differentialis----------	7
3. Boopedon maculatum----------	7
4. Syrbula admirabilis----------	7
5. Trachyrhachis k. fuscifrons--	7
6. Other species (36) and unident.	57
7. Nymphs----------	6

Cotton margins	
1. Melanoplus differentialis----	49
2. Syrbula admirabilis----------	8
3. Chortophaga viridifasciata---	5
4. Encoptolophus sordidus costalis	4
5. Mermiria maculipennis--------	4
6. Other species (27) and unident.	27
7. Nymphs----------	3

Summary

	Percent
1. Melanoplus differentialis----	27
2. Chortophaga viridifasciata---	9
3. Syrbula admirabilis----------	8
4. Mermiria maculipennis--------	6
5. Dissosteira longipennis------	4
6. Other species (49) and unident.	42
7. Nymphs----------	4

UTAH

This is the fourth consecutive year in which collections of grasshoppers were made in typical environments during the adult survey. There were 7,632 specimens collected in 10 environments and 38 species were represented in these collections. There was so little difference between the numbers of Melanoplus mexicanus and M. femur-rubrum that these 2 species could be considered as sharing first place in the economic importance of the different species. M. mexicanus was first in numbers in alfalfa, corn, idle land, and the total numbers of specimens collected. M. femur-rubrum was first in numbers in pasture, salt marsh, small grain, clover, miscellaneous margins, and miscellaneous crops. Opeia obscura and Trachyrachis kiowa were first in numbers on the range, according to the collections, although this statement is based on only 118 specimens. M. packardii was next in numbers in the total number of specimens collected. In the 1935 collections, M. mexicanus and M. femur-rubrum held about the same relative positions in numbers as in the 1938 collections. Then in 1936, M. femur-rubrum became more numerous than M. mexicanus, until in 1937 it was the dominant grasshopper in all environments, forming 69 percent of the total number of specimens collected. In the 1938 collections for Utah, M. femur-rubrum resumed about the same relative position with M. mexicanus as in 1935.

Hatching of grasshoppers began about the middle of April and was prolonged throughout June because of unfavorable weather conditions. The populations as a whole are down and control is confined mainly to irrigated fields and especially to seed alfalfa. Hoppers on adjacent range land give considerable trouble to the growers of seed alfalfa, especially when the range dries up. Relatively small numbers can destroy a great deal of seed and, therefore, a valuable crop.

Distribution by species of 7,632 specimens collected in Utah, expressed in percentage of total number collected in each habitat

Species	Alfalfa	Range	Pasture	Salt marsh	Margin	Clover	Small grain	Corn	Idle land	Misc.	Total spec.	Percentage of total
Aeoloplus tenuipennis Scudd.--	0.11	--	0.10	--	--	--	--	--	--	--	5	0.07
Ageneotettix deorum----------	.21	1.69	--	--	0.68	--	--	2.57	--	1.03	24	.31
Arphia pseudonietana---------	.37	1.69	1.11	--	1.09	--	--	--	1.87	--	51	.66
Aulocara elliotti------------	.42	--	--	--	.41	--	0.50	1.71	2.57	1.03	38	.49
Camnula pellucida------------	.13	--	10.30	39.84	.68	--	7.75	.86	.23	--	199	2.59
Chortippus curtipennis Harr.--	--	--	.20	--	--	--	--	--	--	--	2	.03
Conozoa sulcifrons-----------	.03	2.54	--	--	.41	--	--	--	--	--	10	.13
Derotmema haydenii-----------	--	.85	--	--	--	--	--	--	--	--	1	.01
Dissosteira carolina---------	.50	--	--	--	.88	1.00	5.75	.86	3.51	--	72	.94
D. spurcata------------------	.11	--	--	--	--	--	1.00	--	.23	1.03	10	.13
Drepanopterna femoratum------	.40	1.69	.40	--	--	--	.25	--	--	--	22	.29
Hesperotettix viridis--------	.03	8.47	.40	--	.75	--	--	--	--	--	26	.34
Melanoplus angustipennis-----	--	--	--	--	.07	--	--	--	--	--	1	.01
M. bivittatus----------------	2.75	--	1.92	1.63	5.85	--	4.50	2.57	.47	1.03	235	3.06
M. differentialis------------	.34	--	--	--	--	24.00	--	--	--	26.78	63	.82
M. femur-rubrum---------------	26.32	5.08	43.03	41.46	36.52	43.00	46.00	16.25	26.91	31.93	2,409	31.32
M. keeleri luridus------------	1.06	--	2.02	--	1.63	--	--	--	--	--	84	1.09
M. lakinus-------------------	--	--	--	--	.27	--	--	--	.23	--	5	.07
M. mexicanus-----------------	39.55	3.39	13.94	.81	34.54	31.00	15.00	47.03	46.33	18.54	2,511	32.64
M. occidentalis--------------	.03	--	--	--	--	--	--	--	--	--	1	.01
M. packardii-----------------	9.48	3.39	1.62	.81	8.09	--	5.25	17.10	.70	3.09	546	7.10
M. yarrowii Thos.------------	--	.81	--	--	--	--	--	--	--	--	1	.01
Merniria maculipennis--------	.37	10.16	.51	--	.20	--	--	.86	.23	1.03	37	.48
Metator pardalinus-----------	.03	8.47	--	--	--	--	--	--	--	--	11	.14
Opeia obscura----------------	--	14.40	1.21	--	.20	--	--	--	--	--	32	.42
Oedaleonotus enigma----------	--	--	--	--	--	--	--	--	--	3.09	3	.04
Orphulella pelidna-----------	.08	.85	1.92	1.63	.34	--	.50	--	--	--	32	.42
Phoetaliotes nebrascensis----	.34	--	--	--	.07	--	.25	--	--	--	15	.20
Schistocerca shoshone--------	.03	2.54	1.01	--	.07	--	--	1.71	.47	6.18	25	.33
Spharagemon collare----------	.16	2.54	.10	--	.54	--	.25	1.71	2.81	1.03	34	.44

Species	Alfalfa	Range	Pasture	Salt marsh	Margin	Clover	Small grain	Corn	Idle land	Misc.	Total spec.	Percentage of total
Spharagemon equale	0.11	--	--	--	0.07	--	--	--	--	--	5	0.07
Trachyrhachis kiowa kiowa	.53	13.55	6.26	13.82	.88	--	0.50	0.86	0.47	--	133	1.73
Trimerotropis sparsa Thos.	--	.85	--	--	--	--	--	--	--	--	1	.01
T. melanoptera McN.	--	.85	--	--	--	--	--	--	--	--	1	.01
T. laticincta	--	--	--	--	--	--	--	--	1.40	--	6	.08
T. suffussus Scudd.	--	--	--	--	--	--	--	--	.70	--	3	.04
T. pallidipennis	.55	1.69	--	--	1.70	--	--	--	.94	--	52	.68
T. strenua McN.	--	8.47	--	--	--	--	--	1.71	--	--	12	.16
Nymphs	15.92	3.39	14.44	--	3.47	1.00	12.50	3.42	9.59	4.12	901	11.71
Undetermined	.08	2.54	--	--	.34	--	--	.86	.23	--	13	.17
Total specimens per environment	3,788	118	995	123	1,467	100	400	117	427	97	7,632	--

UTAH

The percentages of individuals of the various species present in Utah, arranged according to crops infested, are summarized as follows:

Alfalfa	Percent
1. Melanoplus mexicanus-----	39
2. M. femur-rubrum----------	26
3. M. packardii------------	9
4. M. bivittatus-----------	3
5. M. keeleri luridus-------	1
6. 21 other sp. and undet.--	6
7. Nymphs-------------------	16

Pasture	Percent
1. Melanoplus femur-rubrum------	43
2. M. mexicanus-----------------	14
3. Camnula pellucida------------	10
4. Trachyrhachis k. kiowa-------	6
5. M. keeleri luridus-----------	2
6. 12 other sp.-----------------	11
7. Nymphs-----------------------	14

Range	
1. Opeia obscura-----------	14
2. Trachyrhachis k. kiowa----	14
3. Memiria maculipennis-----	10
4. Hesperotettix viridis----	8
5. Metator pardalinus-------	8
6. 16 other sp. and undet.--	43
7. Nymphs-------------------	3

Salt marsh	
1. Melanoplus femur-rubrum------	41
2. Camnula pellucida------------	39
3. Trachyrhachis k. kiowa-------	14
4. M. bivittatus----------------	2
5. Orphulella pelidna deserata--	2
6. 2 other sp.------------------	2

Margin	
1. Melanoplus femur-rubrum--	37
2. M. mexicanus-------------	35
3. M. packardii-------------	8
4. M. bivittatus------------	6
5. Trimerotropis pallidipennis	2
6. 18 other sp.-------------	9
7. Nymphs-------------------	3

Small grain	
1. Melanoplus femur-rubrum------	46
2. M. mexicanus-----------------	15
3. Camnula pellucida------------	8
4. Dissosteira carolina---------	6
5. M. packardii-----------------	5
6. 8 other sp.------------------	8
7. Nymphs-----------------------	12

Clover	
1. Melanoplus femur-rebrum--	43
2. M. mexicanus-------------	31
3. M. differentialis--------	24
4. Dissosteira carolina-----	1
5. Nymphs-------------------	1

Corn	
1. Melanoplus mexicanus---------	47
2. M. packardii-----------------	17
3. M. femur rubrum--------------	16
4. M. bivittatus----------------	3
5. Agenceotettix deorum---------	3
6. 8 other sp. and undet.-------	11
7. Nymphs-----------------------	3

Idle land	
1. Melanoplus mexicanus-----	46
2. M. femur-rubrum----------	27
3. Dissosteira carolina-----	4
4. Spharagemon collare------	3
5. Aulocara elliotti--------	2
6. 12 other sp. and undet.--	8
7. Nymphs-------------------	10

Miscellaneous	
1. Melanoplus femur-rubrum------	32
2. M. differentialis------------	27
3. M. mexicanus-----------------	19
4. Schistocerca shoshone--------	6
5. M. packardii-----------------	3
6. 7 other sp.------------------	9
7. Nymphs-----------------------	4

Grand total

		Percent
1.	Melanoplus mexicanus-----	33
2.	M. femur-rubrum----------	31
3.	M. packardii------------	7
4.	M. bivittatus------------	3
5.	Cannula pellucida--------	3
6.	33 other sp. & undet.----	11
7.	Nymphs-------------------	12

WISCONSIN

This is the fourth year in which collections have been made in Wisconsin during the adult survey. Collections were made in 1935, 1936, 1937, and 1938. In 1937 the number of specimens collected was only 242, and this was a meager representation. This past season 13,894 specimens were taken in 7 major environments in which 26 species were represented. Melanoplus femur-rubrum was by far the dominant species in all environments, and formed 60 percent of the total number of specimens collected. M. mexicanus was second in relative numbers, at 11 percent. M. femur-rubrum has held this position for the last 4 years. In 1933 and 1934 Camnula pellucida was most important, especially in the northern part of the State. No real comparisons can be made between 1937 and 1938 because of the vast difference in the numbers of specimens collected.

The hatching of M. mexicanus began during the third week of May in the light-sandy-soil area. Continued rains delayed and prolonged hatching all through June and reduced nymphal populations considerably. M. femur-rubrum was hatching in great numbers the first week of July and at the same time there were also adults in the same field. A great deal of bait was wasted in June because of rains, and most of the heavy baiting was done in July. The grasshopper potential in the 1938 survey is approximately one-half of what it was in the 1937 survey.

WISCONSIN

Distribution by species of 13,894 specimens collected in Wisconsin, expressed in percentage of total number collected in each habitat

Species	Percentage collected in--							Total specimens	Percentage of grand total
	Legumes	Pasture	Tame-hay meadow	Small grain	Idle land	Roadside	Corn		
Ageneotettix d. deorum	0.07	4.36	0.52	2.14	7.62	0.87	2.35	341	2.45
Arphia pseudonietana	.32	.56	1.31	.10	1.00	--	.39	73	.52
Arphia sulphurea	--	.03	--	--	.13	--	--	3	.02
Camnula pellucida	.41	1.75	1.18	.26	2.40	.17	--	144	1.04
Chortippus longicornis	.67	4.75	3.15	.73	.33	.69	1.18	282	2.03
Dissosteira carolina	.05	.05	--	.16	.20	--	.39	11	.08
Encoptolophus sordidus sordidus	.05	.11	.07	.42	.20	--	--	18	.13
Hesperotettix viridis	--	--	.07	--	--	--	--	1	.01
Melanoplus angustipennis	.32	.96	.59	1.09	1.87	--	--	108	.78
M. bivittatus	.37	.21	.26	.31	.67	.17	.39	46	.33
M. confusus	--	--	--	--	--	--	.39	1	.01
M. dawsoni	.16	.32	.20	--	.94	--	--	36	.26
M. differentialis	--	--	--	--	.07	--	--	1	.01
M. femur-rubrum	63.48	59.60	49.60	66.09	47.16	76.26	70.98	8,362	60.12
M. f. flavidus	.05	.03	--	--	.20	--	--	6	.04
M. foedus fluviatilis	.09	.08	--	--	--	--	--	7	.05
M. keeleri luridus	1.03	.88	.59	.89	.40	--	.39	111	.80
M. mexicanus	7.39	8.71	19.49	7.29	23.98	2.25	2.75	1,466	10.54
Orphulella pelidna	.02	.05	--	--	--	--	--	3	.02
O. speciosa	.02	.66	1.12	.05	.33	.17	--	50	.36
Phoetaliotes nebrascensis	.02	--	.13	.10	--	--	--	5	.04
Spharagemon collare	.07	.16	.33	.36	.53	.69	--	33	.24
Schistocerca alutacea	--	.05	--	.10	.13	--	--	6	.04
Trachyrhachis kiowa fuscifrons	.02	.58	--	--	--	--	--	23	.17
T. kiowa kiowa	--	.08	--	.10	--	--	--	5	.04
Syrbula admirabilis	--	.03	--	--	--	--	--	1	.01
Nymphs	25.36	15.99	21.39	19.79	11.82	18.72	20.78	2,751	19.78
Total specimens per environment	4,356	3,765	1,524	1,920	1,497	577	255	13,894	--

WISCONSIN

The percentages of individuals of the various species present in Wisconsin, arranged according to crops infested, are summarized as follows:

Legumes

		Percent
1.	Melanoplus femur-rubrum------	63
2.	M. mexicanus----------	7
3.	M. k. luridus----------	1
4.	Chortippus longicornis-------	1
5.	Camnula pellucida----------	1
6.	14 other species----------	27
	Nymphs - 25	

Pasture

		Percent
1.	Melanoplus femur-rubrum-----	60
2.	M. mexicanus----------	9
3.	Chortippus longicornis------	5
4.	Ageneotettix d. deorum------	4
5.	Camnula pellucida----------	2
6.	17 other species----------	20
	Nymphs - 16	

Tame-hay meadow

1.	Melanoplus femur-rubrum------	50
2.	M. mexicanus----------	19
3.	Chortippus longicornis-------	3
4.	Arphia pseudonietana---------	1
5.	Camnula pellucida----------	1
6.	10 other species----------	26
	Nymphs - 21	

Small grain

1.	Melanoplus femur-rubrum-----	66
2.	M. mexicanus----------	7
3.	Ageneotettix deorum---------	2
4.	M. angustipennis----------	1
5.	M. k. luridus----------	1
6.	11 other species----------	23
	Nymphs - 20	

Idle land

1.	Melanoplus femur-rubrum------	47
2.	M. mexicanus----------	24
3.	Ageneotettix d. deorum-------	8
4.	Camnula pellucida----------	2
5.	M. angustipennis----------	2
6.	13 other species----------	17
	Nymphs - 12	

Roadside

1.	Melanoplus femur-rubrum-----	76
2.	M. mexicanus----------	2
3.	Ageneotettix deorum---------	1
4.	Chortippus longicornis------	1
5.	Spharagemon collare---------	1
6.	3 other species----------	19
	Nymphs - 19	

Corn

1.	Melanoplus femur-rubrum------	71
2.	M. mexicanus----------	3
3.	Ageneotettix d. deorum-------	2
4.	Chortippus longicornis-------	1
5.	4 other species----------	23
	Nymphs - 21	

Grand total

1.	Melanoplus femur-rubrum-----	60
2.	M. mexicanus----------	11
3.	Ageneotettix d. deorum------	2
4.	Chortippus longicornis------	2
5.	Camnula pellucida----------	1
6.	21 other species----------	24
	Nymphs - 20	

WYOMING

This is the fifth year in which collections were made in this State during the adult survey, the other 4 surveys having been made in the years 1934-37, inclusive. Wyoming is one of the 4 original States in which the project was started. Better and larger collections have been made here than in any other State. There were 35,703 specimens collected in 10 different environments, with 52 species represented. Melanoplus mexicanus was by far the dominant species in most environments and in the total number of specimens collected. It comprised over half the hoppers in small grain, corn, and idle land and made up 29 percent of those on the range land. M. femur-rubrum was second in numbers in most places and dominant in sugar beets and beans at 36 and 35 percent, respectively. Beginning in 1935, M. mexicanus has held about the same relative position as to its importance in crop land. Camnula pellucida from second in numbers has fallen off to fifth place during this time. Aulocara elliotti and Ageneotettix deorum gave way to M. mexicanus on the range, because of the large flights of this latter species into eastern Montana in July and August. M. bivittatus remains in about the same relative position in 1938 as in other years.

There was a small hatch of M. bivittatus the third week of April and adverse weather conditions from then on retarded hatching and development and reduced populations. General hatching began during the first week of May. Adults of M. mexicanus and M. bivittatus began to appear between June 1 and 15. During the first part of July, major flights of M. mexicanus moved into all the eastern tier of counties from South Dakota. These flights cause major losses of crops and changed the local picture of 1939. There is little doubt that the grasshopper problem would have been reduced for 1939 if it had not been for these flights. Some heavy egg deposition took place in crop and idle land and a few adjacent areas of range land. Egg pod counts ran as high as 15 and 20 per square foot, with such averages as 4 per square foot for an entire county. This is equal to the egg counts made in the worst areas in South Dakota in the fall of 1937, where the major flights originated the summer of 1938. The extreme eastern counties present a distinct problem, not only from the standpoint of local crop protection but also from the standpoint of preventing a recurrence of major flights that might move into the irrigated sections of northern Colorado.

Distribution by species of 35,703 specimens collected in Wyoming, expressed in percentage of total number collected in each habitat

Species	Percentage collected in--										Total specimens	Percentage of grand total
	Legumes	Small grain	Range	Roadside	Meadow	Idle land	Corn	Mixed crops 1/	Beets	Beans		
Acrolophitus hirtipes	0.02	--	--	0.04	--	--	--	--	--	--	5	0.01
Aeoloplus turnbullii bruneri	--	--	--	.04	--	--	--	--	--	--	1	.01
A. turnbullii turnbullii	.29	0.44	4.59	1.91	0.16	1.54	--	--	4.31	0.78	408	1.14
Ageneotettix deorum	.45	1.10	12.33	1.37	5.28	2.31	4.40	--	--	--	954	2.67
Amphitornus coloradus	.07	.08	1.86	.62	.70	--	.31	0.34	--	--	145	.41
Arphia pseudonietana	.01	.02	.02	--	--	--	--	--	--	--	3	.01
Aulocara elliotti	1.16	2.42	11.71	1.46	6.53	1.15	4.24	1.03	.33	--	1,138	3.19
Bruneria brunnea	--	--	.08	--	--	--	--	--	--	--	4	.01
Camnula pellucida	3.00	5.23	1.51	.75	5.21	.48	1.10	--	.22	--	1,023	2.86
Chloealtis conspersa	.01	--	--	--	--	--	--	--	--	--	1	.01
Chortippus longicornis	.10	.08	.09	.62	.93	--	--	--	--	1.04	58	.16
Cordillacris crenulata	--	--	1.39	.04	--	--	--	--	--	--	75	.21
Cordillacris o. occipitalis	.01	--	1.02	.37	--	--	--	--	--	--	64	.18
Cratypedes neglectus	.01	--	.04	--	--	--	--	--	--	--	3	.01
Derotmema haydenii	.03	.10	.23	.62	.08	.10	.31	.34	--	.26	45	.13
Dissosteira carolina	.17	.35	.06	.21	.08	.29	.94	1.71	.22	.78	82	.23
D. longipennis	--	.02	--	--	--	--	--	--	--	--	1	.01
Drepanopterna femoratum	.09	.08	2.05	.33	1.55	.48	.31	--	--	--	165	.46
Encoptolophus sordidus costalis	.02	.02	.06	--	1.09	--	--	--	--	--	21	.06
Hadrotettix trifasciatus	.07	.16	.34	.17	.23	.58	.16	--	.22	--	56	.16
Hesperotettix viridis	.05	.15	.38	.46	.08	.48	.47	--	--	--	57	.16
Hypochlora alba	.01	.02	.04	--	.16	--	--	--	--	--	7	.02
Melanoplus angustipennis	.73	3.09	2.09	4.62	.47	6.44	2.35	2.57	.22	1.30	647	1.81
M. bivittatus	9.36	6.55	1.75	7.29	9.40	1.25	3.14	1.03	12.72	11.72	2,572	7.20
M. b. bowditchi	.03	.10	.28	1.87	--	.96	--	.17	--	.52	85	.24
M. bowditchi canus Hebard	.03	.08	1.36	.21	.70	.77	1.57	--	--	--	115	.32
M. confusus	.01	.02	.02	--	--	--	--	--	--	--	4	.01
M. dawsoni	.10	.02	.17	--	.08	--	--	--	--	--	29	.08
M. differentialis	.28	.08	.13	.79	.08	.10	--	--	.65	.26	86	.24
M. femur-rubrum	23.25	11.99	3.84	15.49	22.07	4.32	14.91	.51	36.21	35.42	6,115	17.12

WYOMING (Continued)

Species	Percentage collected in--										Total specimens	Percentage of grand total
	Legumes	Small grain	Range	Roadside	Meadow	Idle land	Corn	Mixed crops[1]	Beets	Beans		
Melanoplus foedus fluviatilis--	0.01	--	--	--	--	--	--	--	--	0.26	2	0.01
M. foedus foedus----------	.21	1.18	1.51	7.37	--	4.71	0.16	2.40	0.22	1.56	437	1.22
M. gladstoni----------	.05	.43	.64	1.37	.23	.10	.16	--	--	--	106	.30
M. infantilis----------	.07	.61	3.62	.92	.39	.38	2.35	.68	--	--	291	.81
M. keeleri luridus----------	--	--	--	--	--	.48	--	--	--	--	5	.01
M. lakinus----------	.01	--	--	.04	--	--	--	--	--	--	2	.01
M. mexicanus----------	29.76	51.60	28.68	38.09	31.00	52.54	56.04	81.85	16.81	31.77	12,777	35.78
M. occidentalis----------	.07	.10	.98	.29	--	.10	.31	1.03	--	--	87	.24
M. packardii----------	2.72	1.33	3.09	3.25	1.09	11.34	1.73	2.74	1.08	5.73	987	2.76
Mermiria maculipennis----------	--	1.89	.11	.12	.16	--	--	--	--	--	126	.35
Metator pardalinus----------	.08	.18	1.64	.75	1.01	--	.31	.68	--	--	149	.42
Opeia obscura----------	.02	.05	.96	.37	.39	--	--	--	--	--	71	.20
Orphulella pelidna----------	.03	--	.04	--	.78	--	--	--	--	--	17	.05
Paropomala wyomingensis--------	.01	--	.09	--	.08	--	--	--	--	--	7	.02
Phlibostroma quadrimaculatum---	.03	.07	5.59	.29	.47	.19	--	.68	--	--	325	.91
Phoetaliotes nebrascensis------	.04	.26	.72	.08	.85	.19	--	.51	--	--	79	.22
Spharagemon collare----------	.19	.49	.49	1.00	.16	2.11	.47	.34	--	.26	144	.40
S. equale----------	.03	.12	.41	.08	--	.58	.63	.51	--	--	50	.14
Trachyrhachis k. kiowa---------	.03	.05	1.24	.17	.47	--	.16	--	--	--	85	.24
Trimerotropis gracilis---------	--	--	--	.08	--	--	--	--	--	--	2	.01
T. laticincta----------	.01	.05	.04	.12	--	.10	--	--	--	--	11	.03
T. p. pallidipennis----------	.01	.03	--	--	--	--	--	.51	--	--	7	.02
Undetermined----------	.08	.05	.13	.08	.23	--	.16	--	--	--	30	.08
Nymphs----------	27.06	9.26	2.54	6.24	7.85	5.96	3.30	.34	26.94	8.33	5,937	16.62
Total specimens per environment----------	17,520	6,076	5,308	2,402	1,287	1,041	637	584	464	384	35,703	--

1 Sudan, cane, millet, and potatoes.

WYOMING

The percentages of individuals of the various species present in Wyoming, arranged according to crops infested, are summarizedas follows:

Legumes	Percent
1. Melanoplus mexicanus	30
2. M. femur-rubrum	23
3. M. bivittatus	9
4. Camnula pellucida	3
5. M. packardii	3
6. 40 other species	32
Nymphs - 27	

Small grain	Percent
1. Melanoplus mexicanus	52
2. M. femur-rubrum	12
3. M. bivittatus	7
4. Camnula pellucida	5
5. M. angustipennis	3
6. 34 other species	21
Nymphs - 9	

Range	
1. Melanoplus mexicanus	29
2. Ageneotettix deorum	12
3. Aulocara elliotti	12
4. Phlibostroma quadrimaculatum	6
5. Aeoloplus turnbullii turnbullii	5
6. 38 other species	36
Nymphs - 3	

Roadside	
1. Melanoplus mexicanus	38
2. M. femur-rubrum	15
3. M. foedus foedus	7
4. M. bivittatus	7
5. M. angustipennis	5
6. 33 other species	28
Nymphs - 6	

Meadow	
1. Melanoplus mexicanus	31
2. M. femur-rubrum	22
3. M. bivittatus	9
4. Aulocara elliotti	7
5. Agencotettix deorum	5
6. 27 other species	26
Nymphs - 8	

Idle land	
1. Melanoplus mexicanus	53
2. M. packardii	11
3. M. angustipennis	6
4. M. foedus foedus	5
5. M. femur-rubrum	4
6. 22 other species	21
Nymphs - 6	

Corn	
1. Melanoplus mexicanus	56
2. M. femur-rubrum	15
3. Ageneotettix deorum	4
4. Aulocara elliotti	4
5. M. bivittatus	3
6. 18 other species	18
Nymphs - 3	

Mixed crops	
1. Melanoplus mexicanus	82
2. M. packardii	3
3. M. angustipennis	3
4. M. foedus foedus	2
5. Dissosteira carolina	2
6. 14 other species	8
Nymphs - 0.34	

Beets	
1. Melanoplus femur-rubrum	36
2. M. mexicanus	17
3. M. bivittatus	13
4. Aeoloplus t. turnbullii	4
5. M. packardii	1
6. 7 other species	29
Nymphs - 27	

Beans	
1. Melanoplus femur-rubrum	35
2. M. mexicanus	32
3. M. bivittatus	12
4. M. packardii	6
5. M. foedus foedus	2
6. 9 other species	13
Nymphs - 8	

WYOMING (Continued)

Percentage of grand total

1.	Melanoplus mexicanus----------	36
2.	M. femur-rubrum----------	17
3.	M. bivittatus----------	7
4.	Aulocara elliotti----------	3
5.	Camnula pellucida----------	3
6.	47 other species----------	34

Nymphs - 17